

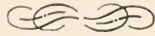
THE MICROCOSM:

THE ORGAN OF THE

Substantial Philosophy.

DEVOTED TO THE DISCOVERIES, THEORIES, AND INVESTIGATIONS OF
MODERN SCIENCE, AND THEIR BEARINGS UPON THE
RELIGIOUS THOUGHT OF THE AGE.

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THE LAWS OF MIND.—No. 4.

BY REV. J. W. ROBERTS.

Having passed up through the realm of matter by self-evident propositions, and their only logical results until we have reached the boundaries of the domain of intelligence by two different methods of approach, or highways of mental travel, it will not be out of place for us to enter the territory of the far-outreaching empire, where reigns the glory of Supreme Intelligence and sheds forth its eternal radiance.

But let us pass into this region by surestages, so that when once we have secured a place there it will be impossible to cast us out or successfully assault the breastwork of reason and the strong towers of logic and fact which shall make our citadel then as impregnable as the everlasting hills. By axioms and analogies, principles and truths, the invasion shall be made, and the communications with the base of supplies secured. In all the multifarious operations of Nature this inexorable rule prevails:

Every effect must have an active, efficient, and adequate cause.

And it may with equal propriety be said that this inflexible rule applies to works of art as well as of Nature. Let us illustrate this axiomatic principle.

The pyramids of Egypt, Mexico, and other nations of antiquity exist. For centuries their origin was wrapped in profound mystery, and even now, after all the research that has been made to cast light upon the subject, there is much more of conjecture and speculation in regard to them than of actual known truth. How came they into existence? has been the puzzling inquiry during the ages. But at no time has it ever been doubted that they were designed and constructed by men. They could not come into their positions and completeness by chance. They could not construct themselves. Nor could all the beasts of the field, the fowls of the air, and the fishes and monsters of the sea combined erect them. Why? Because they were all inadequate to the task. The huge beasts of the dry land and the monsters of the deep were physically vastly superior to man in strength, and so far were sufficient for the work; but they could not plan a structure of the kind, nor devise the means to the ends in its upbuilding. Mentally they were utterly inadequate to conceive or execute a work of this kind; and so there can be but one other conclusion reached, that beings of a higher order of intelligence must have originated and perfected these gigantic specimens of intellectual and mechanical skill. Man only, of all the beings existing on the globe, was qualified to do the work; and hence every intellectual person in Pagan or Christian lands, who knew anything about the matter, without a moment's hesitation assigned these feats of genius and workmanship to man. While the origin of these great works remains largely in obscurity, and the immense pieces of rock of which some of them are composed might well

stagger the credulity of man, and the exact mathematical precision with which all the parts and the whole structure is put together, astonishes the beholder and compels his admiration; and while these things and the wonderful astronomical representations demonstrate the knowledge of the wise men of those remote periods of time, yet the men of this age *know* that the pyramids were constructed by men in those earlier days of the race. The mechanical processes and appliances necessary to carry forward such gigantic enterprises are unknown. But the massive rocks are there in their places—placed with a precision and skill which have never been excelled; and amid all the mist and fog and mystery surrounding them, they are beyond question the result of human ingenuity and human labor.

Another thing is equally apparent, namely, that there was one grand designer of each piece of workmanship, and not a number of designers, and this fact is clearly proved by the *unity* of purpose, *oneness* of aim, and complete correspondence of the parts to the entire structure. Five projectors could not have reached this perfect unification of every part, and of all the parts with the grand whole. If more than one man's thoughts entered into the design, they were all finally put through the crucible of the one mental laboratory and fused into their unification and this is manifest.

After the statement of an argument of like nature with the foregoing, it is quite the rule for logicians to draw a parallel between such an exhibition of design and execution and the more illustrious exhibition of these characteristics in the sublime domain of Nature; and the line of thought and argument is appropriate; more than this, it is unanswerable. But the purpose now is to present another phase of the case, which has been overlooked. It is this;

All persons who are informed on the subject *know* that the pyramids exist, with as much certainty as that they know them to be the work of men. How do they obtain this knowledge? Probably not one in a million of those who possess this knowledge ever saw those famous piles of rock and cement, or obtained any information concerning them by personal contact of any kind. This knowledge is obtained by giving attention and credit to what others who have visited and investigated them say about them. Hence here, as everywhere, *faith* comes in as an essential factor in the acquisition of knowledge, and the dim uncertainty which shrouds the origin of these great works does not for a moment cause us to question their human origin. The inability to account for the methods and mechanical appliances necessary to plant those huge masses of rock in their places after transporting them from the quarries, does not create a doubt of the *fact* that they were so moved and placed. All this is accepted as true, without doubt or questioning, though the inquiry and search for the lost arts continue.

There are probably not a hundred persons now living who ever saw George Washington, the "Father of his Country," and yet there are

millions of people in this and other lands who *know* that Washington lived and acted his great and grand part in the history of the world. No man living in this age ever saw Alexander the Great, Julius Caesar, Hannibal, Cicero, Plato or Demosthenes; but there are multiplied millions who *know* that these men lived and acted their part on the vast stage of human affairs. Examples could be multiplied in all directions indefinitely, but these are ample to illustrate the point under consideration, namely, that *faith is a necessary element in all knowledge.*

It may be objected that what a man learns through the medium of his senses is obtained without the aid of faith. But this is a mistake. Persons have defective senses; the vision, the hearing, or any other sense may be imperfect, and therefore not reliable. Persons are often heard to say: "If my eyes do not deceive me;" or, "If I hear aright, so and so is true." In case of sickness the patient complains that the "taste is gone, or is wrong; and that nothing seems natural." Illustrations could be carried to any extent, but to clearly set forth the idea is all that is required. *Faith that the senses themselves are right* must be had before the judgment will accept as true the report they bring for its consideration. Experience teaches that if they are not right and in a normal condition they will deceive and mislead. To illustrate this fact still further let us take a case of common occurrence:

Two men standing side by side witness an event transpiring in their immediate presence. They are both men of unquestioned veracity and intelligence, and will tell the truth, and they have no interest at stake. Take them into a court of justice, place them on their oath to "tell the truth, the whole truth, and nothing but the truth" in reference to the transaction, and their evidence will vary—often very considerably. Not, as a rule, that the statement of one will conflict with that of the other; but each saw and tells of circumstances that the other did not see. Occasionally these statements amount to a disagreement. Why this difference? It is a result of defect of vision not known to exist, or of mental differences in the men, or some peculiar idiosyncracies on the part of one or both of them. From these and other premises which will readily suggest themselves, we are forced to this conclusion:

Knowledge derived through the senses is not always reliable. Before it can be accepted beyond question, *faith in the senses must be established.*

"I was mistaken," is a common remark heard in reference to what the speaker saw, or supposed he saw, or, in which he had been deceived by some one or more of the five senses.

The scientist and philosopher scout the idea of faith in their researches, and set up the claim that before a proposition is accepted it must be *proved* or demonstrated; but they act by *faith* every day of their lives. They must first have faith in the ability, honesty and acquirements of one of their own number, or any one else, before they will accept his statements as true or worthy of consideration and credit. So of the historian, of the mathematician, the chemist—of all and each who come before the world as teachers or bearers of facts. Faith in the teacher or the messenger is the *first* thing required before the instruction or the

message will be received. From these and kindred considerations without number, this proposition is clearly established:

Knowledge and faith are inseparably united and cannot be divorced. And the following, which is like unto the other, but with a perceptible difference: *Faith is the underlying principle of all knowledge.*

These are fundamental elements in all departments of human investigation. Faith in the man and in the reliability and accuracy of his information are essential to the acceptance of the information he claims to impart. We must have faith in the integrity, impartiality and scope of information possessed by the historian before we accept as true the record he gives us. And so it runs through every avenue of knowledge *without exception.*

The field here is so broad that the temptation to enlarge is strong; but as these papers are written for thoughtful readers, the statement of leading and underlying principles must suffice, and each reader can occupy the wide domain stretching out before him as inclination or fancy may lead him.

It will be appropriate at this point to state another axiom, which is this:—*Every fact in Nature of which we can obtain any knowledge through the mediums of the five senses is an effect.* This truism applies to works of art as well as of Nature, but at present that branch of the subject is not under consideration. Hence, whatever we see, or hear, or come in contact with, around, beneath, above, in all the wide domain of the universe are effects, each one of which has an efficient and adequate cause. Nothing has come by chance; nothing has come of itself. *The cause of each fact must be found outside of the fact itself, and must be superior to the fact;* for the thing produced is of necessity inferior to the power that produced it. The creature is always inferior to the creator. Or, according to the axiom, the greater must always contain the less.

Intelligence can change, mould and modify the appearance and constituent elements of gross matter; but *intelligence itself must be produced by intelligence;* for like produces like, and, as just stated the less cannot produce the greater. Mind can control matter and is, therefore, superior to it. Matter, then, never could originate or create mind. This has also been demonstrated from its inertia and its non-possession of any quality of intelligence, and the utter impossibility of its imparting to anything that which it did not itself possess. So from these multiplied bases the same unavoidable conclusion is reached.

Nature is everywhere luminous with the most wonderful display of intelligence, both in design and execution. From the grain of sand or mote in the air, to the mightiest worlds that roll in space, there is everywhere visible the workmanship of a Master-BUILDER; the sublime exhibitions of an Architect whose skill is infinitely beyond the reach or conception of any other; and an Artist whose pencil-touches are so magnificently grand, glorious and luminously splendid as to awe into reverence, hush into silence, and lift us with exaltation.

How came this stupendous frame-work of the universe? Where originated this intricate and delicate machinery, so complex and commingled, so constantly crossing and inter-crossing, and yet forever in perfect harmony

and never becoming entangled or disjointed? Did this wonderful structure come by chance or make itself? Did this astonishing system of balances and checks, of poise and counterpoise, of simplicity and complexity, organize itself or come by accident?

These questions are already answered by the axioms which have gone before, and forever answered in the negative. He who must find an adequate cause for the existence of the pyramids, though their origin is wrapped in mystery, must also find an adequate cause for the "glorious universe around," though its origin may be out of sight, and out of reach, of merely finite research or that mode of investigation which is confined to the efforts of the five senses.

Let the reader constantly bear in mind all the axioms which have been presented in these pages, with their necessary inferences, for they will be found of constant application and needful at every stage of the inquiry. We are now entering upon a plane of investigation which will develop new lines of thought and a new class of illustrations; but the elementary principles will run like a golden thread through all the multifarious phases of inquiries after truth, as the alphabet reaches to the highest development of poetry, elocution and rhetoric; and as the simple numerals are an inseparable part of the higher mathematics.

OSKALOOSA, KANSAS.

THE FREEDOM OF THE WILL.—No. 3.

BY PROF. I. L. KEPHART, A. M.

Question 6.—"How can the will be free when it evidently performs the function of a medium between the cause and its effect—the circumstance or motive or influence the cause, the will the medium, and the subsequent action the effect?"

The assumption embraced in this question, viz., that the will performs the function of a medium between a cause and its effect, is evidently false. It is in direct opposition to the declaration that appetite, motive, influence, are the will's solicitors, but the will is the controller of these. On this point I can do no better than quote from L. D. McCabe, D. D., L. L. D. He says: "The will involves two distinct powers, the elective and the conative. The elective power is the selecting, preferring, deciding and choosing something out of many. The elective involves the intellectual and the volitional. The intellect surveys the object, estimates its advantages, or disadvantages, and the imagination clothes the same with charm or disgust as the case may be. After this deliberation, the elective volition makes a choice. The conative power is purely volitional. Volition is the actual putting forth a resolve to attain that which the elective volition had chosen. *A volition is not the result of an action, for it is action itself. It is not determined, for it is a determination. It is an act of the will, but not an effect on the will.* * * * That personal worth can attach to an act in which and to which we are constrained by a superior power or influence, to the degree that renders impossible a different choice, is a manifest self-contradiction."

This is surely the true position. As defined by the best metaphysicians, the will is that

fundamental power of the mind which decides, determines. It is not a mere passive element, acting as it is acted upon. Were it such, man would be utterly incapable of virtue. Were it a mere medium between circumstances motives and influences, and subsequent actions resulting therefrom, man could never merit reward or punishment. On this point Dr. McCabe very truly and forcibly says: "If in heaven God takes delight in a saint, He must respect him; but He cannot respect him any more than He can a flower or a star, if all his choices to love and obey Him were constrained. Neither could He respect the angels who cast their crowns at his feet, did they do it by constraint. Binding constraint on human liberty where moral character is involved, is philosophically unthinkable. It is also a terrible reflection upon infinite benevolence, in that it does not equally restrain poor reprobates with the chosen favored elect."

Joseph Cook has very aptly said: "Sin exists by reason of the abuse of free-will." But by whom was the free-will abused? Certainly not by God, for that would be to array God against Himself. Nor was it by the "circumstances, motives or influences" for they are not persons, and consequently are incapable of responsible action. It must then be by the elective, volitional power of the free moral agent—one who, outside of the Almighty, can originate responsible action, that the free-will was and is abused; therefore sin exists. To such an one a question of obedience or disobedience—right or wrong—is presented. There are reasons why the individual should obey or disobey—do the right or the wrong. Circumstances, motives, influences, conspire to sway the will one way or the other. "Memory, imagination, reason, intuition and conscience, all are active from within. Right, justice, duty, reverence, self-love, prudence, self-gratification, present realization, fear of ruin, hope of recovery from indulgence, all join in the solemn conflict. But amid it all the will sits serene, *because it is not an intellectuality, nor is it a passivity.* It is not a receptivity, but it is a positive power of activity. (See Dr. McCabe's "Divine Nescience," page 165.)

If the circumstances, motives and influences so conspire and so powerfully assault the individual as to completely over-ride and coerce the will beyond its power to resist, and thus constrain the individual to do the right or to do the wrong, then there is no virtue in the former nor vice in the latter. If a man commits murder, constrained thereto by circumstances, motives, or influences that his will could not resist, he is not criminally guilty, unless by previous yieldings to evil influences when he could have resisted them, he has measurably rendered his will impotent as to questions of right and wrong.

Question 7.—"As there stands at the helm of a ship reason and judgment to direct the ship's course, so may there not stand at the helm of our will goodness, passion, or whatever attribute of the mind may at the time be called into action by the peculiar circumstances of the time, place and condition, and it determine our choice and volition?"

The answer to this question has been anticipated in the answers given to the previous ones. "The peculiar circumstances of the time, place and condition," have much to do in determining our choices and acts at that

particular time. By previous acts of the will, we may be now so completely fortified against vice that an ordinary inducement thereto would have no weight with us whatever; or we may have become so habituated to yielding to the wrong that a mere peccadillo of an inducement may overwhelm us into crime. But while goodness and passion may and do stand before the will, and motives and influences do endeavor to weaken its power and sway its action, they do not "stand at the helm of the will," determining its action. It is the will that stands as the self-acting, self-determining helm of the man, and when all influences have spent their force, this self-determining, self-acting helm, the will, determines what the man shall do, and puts forth volitions accordingly. On this point Dr. McCabe says: "Motives are objects or reasons addressed to our sensibilities. They are the essential conditions of choice, but it is impossible that they should control choice. It is impossible for them to do this, because choice necessarily requires opposing motives, between which the will must make a responsible choice. This action of the will I prefer to call personic, for the reason that personality necessitates not only power over motives, but in addition *power to elict between motives*. A person must be sovereign over his sensibilities, sovereign over all motives addressed thereunto, or a consistent system of theology, and everything which involves morality, are whelmed into the vortices of confusion, perplexity and dismay. * * * The vital point of virtue is the personic choice of goodness and the personic rejection of badness. The essential point of vice is the personic choice of badness and the personic rejection of goodness."

Dr. W. B. Carpenter says: "Every man feels that he really possesses a self-determining power, which can rise above all the promptings of suggestion, and can mold external circumstances to its own requirements. And any system of philosophy which rejects the self-determining power of the will, or which regards the will as only another expression for the preponderance of motives, leads to the conclusion that man can be neither rewarded nor punished deservedly."

Dr. George P. Fisher says: "Choice is not the resultant of motives, as in a case of the composition of forces. Motives are an influence over us, but influence must not be confounded with casual efficiency. Motives are sent and felt, but a consciousness of pluri-potential power ever remains in full vigor. We can initiate actions by an efficiency which is neither irresistibly controlled by motives, nor determined by a proneness inherent in its nature. We can withstand temptations to wrong by the exertions of an energy which consciously emanates from ourselves, and which we know we could abstain from exerting. My consciousness attests that my acts are not the necessary consequences of antecedents, whether in the mind or out of the mind. The constraint of the will by exterior causes is fatalism. Spontaneity confined to a single path, by a force acting from within, is determinism. And both fatalism and determinism are promptly rejected by every unsophisticated mind. Indeed, the consciousness of self could never be evoked were the mind wholly passive under impressions from without. Self, without freedom of the will, would

be an inchoate being. Self-determination, as the very term signifies, is attended with an irresistible conviction that *the direction of the will is self-imparted*."

I could multiply quotations from the ablest metaphysicians of modern times to establish my assertion that the assumption contained in the question is false, but it is not necessary. The above are sufficient. I may, possibly, in another article consider some results that necessarily attach to the inevitable conclusion that the will, as a self-determining power, is free.

LEBANON, PA.

THE BEST ARGUMENT FOR THE IMMORTALITY OF MAN.

THOMAS MUNNELL, A. M.

Few nobler sentiments have ever been written by man than the first one in the preface to the Problem of Human Life, where the Author declares that his main purpose is to ascertain what additional light can be thrown upon the question of Immortality from the electric lights of Science and Philosophy. Not that he doubts the sufficiency of the evidence of the Bible, for those who will admit the fact of revelation, but to reach other classes of mind who may be led to believe the Scriptures by the corroborating testimony of witnesses they do accept. The Bible and Nature are the "Two Witnesses" for God and his truth, and the Christian feels that both are his. But not every one that has tried to make Nature speak in favor of Immortality has succeeded, for in many instances they have laid hold of facts which however decisive on other questions were never intended to illustrate this subject. For example: Isaac Taylor in his *Physical Universe* thinks the fact that the mind of man can work the body down and compel it to recuperate in sleep and rest, proves the superiority of the mind and points toward its immortality. But whatever there is in this proves just as much for animals as for men, for the same is true of both, and such carelessness in handling the facts of Nature may weaken rather than strengthen her testimony in the estimation of the skeptical. But in the hands of such philosophers as Socrates, Isaac Hoffer and the editor of the Microcosm, Nature reveals her sympathy and agreement with the Bible in this great doctrine which is the hope of earth and the joy of heaven. And yet I think it will be admitted by all Christian Scientists that were we left to this kind of evidence alone few men would be qualified to understand the reasonings by which we arrive at such a conclusion, and fewer still would be so satisfied with it as to "rejoice in hope of the glory of God." Even Cicero, when, in his "Tusculan Disputations" he weighs the famous argument of Socrates which has never been excelled from the philosophic viewpoint, does not feel so satisfied with it as to give him any calm composure or restful hope of a Hereafter. While all intelligent believers accept and also claim as their own every corroborating argument or even hint uttered by Science and Philosophy it must be manifest that there is an argument sounder, stronger and more soul-satisfying than any of these.

Christ "brought Life and Immortality to light"

by his Resurrection. Of the fact of the Resurrection we have the most abundant proof—proof that is well able to take care of itself whenever its sufficiency is assailed. This evidence is based on *facts* that form the foundation of our *faith*; and so “we walk by faith and not by sight.” This leads us to notice

1. That no fact in history was ever proved but once, and that was when the fact occurred and while the witnesses were living. Their testimony was imbedded in the literature of the time and is therein handed down for the faith of all generations to come. We have no direct evidence of the existence or exploits of Caesar except from the literature or monuments of his times, and so with every other historic character of every age. Now the evidence concerning Jesus is that he arose from the dead and as that fact likewise was substantiated at the time by eye witnesses and the evidence committed to writing we claim that the fact of his Resurrection is beyond comparison, the best argument for the Immortality of man. “If Christ be not risen our preaching is vain, and your faith is also vain,” and the argument for Immortality is wounded incurably and that forever. But to deny the Resurrection involves the greatest uncertainty not only as to a Hereafter at all, but as to the very notion of a spiritual universe, of immaterial entity, and of God himself; for if the Divinity of Christ has not been proved by his Life, his Death and his Resurrection, all evidence is at a heavy discount and no argument can place the truth of any proposition beyond a doubt.

2. If Christ was Divine in his spiritual nature he was raised from the dead, for Divinity could not make false pretensions and then try to prove them true. That he was not a mere man is evident because he died for his enemies—a deed no human could even undertake. “Greater love has no man than this, that a man lay down his life for his friend.” This is the limit of human love, and you might as well try to take up a mountain in your arms as to die willingly for your enemy.

3. Of all the “Ten Great Religions” treated by James Freeman Clarke, Max Müller and others, no one of them except the Christian Religion, ever thought of, or ever taught the doctrine of “salvation by the Remission of Sins.” The idea of taking away sin from the soul and thereby leaving it *sinless*, just as Jesus cleansed a human body from the leprosy by driving it out and leaving the flesh untainted, is wholly unearthly and altogether heavenly in its origin. Not one of the other Nine Religions ever arose above the common conception of *legalism*. Even Buddha the Author of the best of the heathen religions, after all his self-denial and professed great illumination, reduced his religion to this—“Do well and it will be well with you”—mere legalism. Who did not know all that? But as for the man that had not done well and was under the condemnation of sin, what about him? It is all well enough to say to the healthy man—observe the laws of health and you will be healthy; but what about the man that has violated the laws of health and is sick? If a citizen never transgresses the laws of the land he will never get into prison or be amerced in fines, but what if he is already in prison or has already been fined and cannot release himself? Now Jesus came as a physician to cure the sick, to open

the prison-doors, to save from sin and to place the transgressor before the law just as if he had never sinned. In this work Jesus stands out alone without a rival or even a “pretender” to his “throne of grace.” Why compare him with Socrates and others as to his system of morals, his apothegms or his philosophy? Although he is far above all in these particulars as the mere concomitants of his Divine nature, yet he did not come into the world to contend for such ivy crowns as these, and it would make no difference whether he could excel Homer as a Poet, Euclid as a Geometrician or Newton as an Astronomer, or not, for he came into the world “To save sinners.” Who else ever offered to save us *from our sins* or ever thought of it?

Now if from these and the many other evidences of Christ’s divinity we behold the “Faithful and True Witness” to the doctrine of Immortality, let us regard his testimony as the best and highest argument. Accept all we can obtain from Philosophy, but remember, after all, we walk by faith as to this hope—faith in the Son of God, the peerless champion of the truthfulness of a future life. He taught a Hereafter and *therefore* it is true.

MT. STERLING, KY.

PHYSICAL AND SPIRITUAL GYMNASIA.

BY PROF. G. R. HAND.

“For bodily exercise profiteth little; but godliness is profitable unto all things.”—1 TIM., 4: 8.

Providentially, the light of Science is permitted to throw its radiant beams over the face of Nature, unfolding, in panoramic view, the entities and activities, of the ceaseless ongoings in the great machine shop of Creation, enabling the lover of truth to cull his specimens for analysis in the laboratory of the Great Chemist of the universe, under the calcium light of divine revelation. Possibly the casual reading of the text at the head of this paper might reveal to the untrained mind nothing more than the disparagement of bodily exercise, and the degrading of the human body to a low rank as an object of Christian estimation. Fanatical enthusiasm may carry this sentiment to extremes, and lead to the “neglecting of the body,” as a kind of burdensome appendage, to be endured for a while, as a necessary evil.

But such an idea is neither scriptural, nor philosophical, and the analysis of our text will yield no such ingredients. But on the contrary, the combined light of science and revelation, will tend to elevate the body to the position it is entitled to occupy in our affections. While it is true that, in the text, the physical and the spiritual are placed in antithesis, it is not to degrade the physical, but to elevate the spiritual, or as the Roman orator expressed it: “Not that I loved Caesar less, but that I loved Rome more.”

The apostle had just instructed Timothy to avoid common and silly fables, “and exercise thyself rather unto godliness.” Then as a basic reason for exercising godliness, he adds: “For bodily exercise profits little; but godliness is profitable unto all things.” The noun, “exercise,” in the text is *gymnasia*, in the Greek, and the verb, “exercise,” in the previous verse, is the verbal form of the same *gymnasia* in the Greek. So the status of the

entities and activities, placed in antithetical counterpoise, may be labeled: PHYSICAL GYMNASIA *versus* SPIRITUAL GYMNASIA. The first member of this antithesis, will be placed in the focus of the light of science, and the second in that of the light of revelation, that the combined brilliancy may photograph, upon our mental canvas, distinctly outlined, their intrinsic and relative importance.

The apostle does not say that bodily exercise is of but little profit, but that bodily exercise [gymnasia] is profitable *for a little*, [pros oligon] that is, for a little while; but the godliness, *for all*, [pros panta,] for all things, or all time. As if to place it beyond peradventure, that *duration* is in contrast, he adds: "Having the promise of the life that now is, and of that which is to come."

Physical gymnasia, then, is located in this life, and is profitable only in this life, but is profitable nevertheless. "Thespirit of the man that is in him," and lives and moves and controls, and superintends the activities and growth and repairs, of the physical organism, during this life, is destined to leave this tenement of clay behind, and step out into the unseen, leaving behind "the life that now is," in which bodily gymnasia is profitable, and entering the borderland of the life "that is to come," with the promise of the benefits of the spiritual gymnasia, to minister aid and comfort, when the cycles of time have merged into the golden cycles of eternity.

Peter speaks of being "in this tabernacle," and of "putting off this my tabernacle," which he calls his "decease." 2Pet. 1:13-15. This shows that Peter recognized the spirit of man as an entitative being, an immaterial substance, dwelling in a tent or tabernacle of material substance, which he must put off at his decease.

Paul recognizes the same inner man, and outer man, and tabernacle dissolved, &c., and has the inward man "renewed day by day," while the outward man is perishing, and says: "the things that are seen are temporal, but the things that are not seen are eternal." [aiōnia.] Now in this case, the things seen are the bodies, and the things not seen are the spirits, making the bodies temporal, and the spirits eternal, which again limits the valuation of Physical gymnasia to this life, and passes the spiritual, with apostolic benedictions, through the portals of eternity. See 2 Cor., 4:16-18.

But, though invisibility to mortal eyes may be predicated of the spirit man, yet visible exhibitions of its presence and power in the physical organism are abundantly manifest. From the invisibility of the entity, and visibility of its activities, as to man's spirit, Paul makes an excursion into the realms of Nature, and draws a similar lesson from the attributes of the invisible God, and the visible manifestation of his power and immanence in the works of Creation. "For the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even His eternal power and Godhead." Rom. 1:20.

Physiology opens its portals before us, inviting our attention to numerous examples, and practical illustrations of the truth affirmed in the statement: "Bodily exercise profits," though limited to this life. A few of these must suffice for the present.

The apostle, being familiar with Grecian philosophy, knew well the status of the Gym-

nasia, in the national system of Grecian education, and was prepared to affirm an admitted truth in saying that "bodily exercise profits." The Grecian youth, trained in the gymnasia, were monuments of its truth. The bodily exercise, or gymnasia, developed their physical organism, expanded and strengthened their muscles, promoted a free circulation of the blood, and a healthy action of the whole corporeal system, and thus it "profited" the young men by endowing them with health and strength and power of endurance, to go forth as soldiers, and fight the battles of their country.

Other nations besides the Greeks had their gymnasia. Most of the modern nations recognize the value of the gymnasia, and have some kind of gymnastic exercises, either in their public or private systems of education.

Prussia gives the training of the body a prominent position in her national system of education, and some of the most perfect specimens of well-formed limbs, finely developed muscles, with wonderful strength and power of endurance, that I ever saw, were trained and moulded in the Prussian Gymnasia.

In the United States, where "Young America" comes to the front so constantly, there is, perhaps, not so systematic a recognition of gymnastic exercises, or physical training, in our national education. Yet, in nearly every city will be found a gymnasium, or some place of physical training, either public or private. They are sometimes called *turn* halls, and *turn* exercises, referring to the fact that these exercises turn out finely-developed and rounded forms, in body and limb, like a turning lathe turning out beautifully rounded forms in wood and metal.

In a thoroughly furnished gymnasium, with apparatus and well-appointed outfit, there are various appliances, adapted to all the muscles of the body, so that each part of the human form, so "fearfully and wonderfully made," can receive its share of exercise in turn, and "profit for a little" thereby.

The advanced systems of education in some of our large cities have, incorporated in their workings, a gymnasia especially arranged for the young ladies of the schools, and known under the new nomenclature as *calisthenic* exercises, the change in the name being suggested by the etymology of the word *gymnos*, meaning *naked*, and the Grecian youths sometimes practising without the incumbrance of clothing. Modified and introduced into our mixed schools of young ladies and young gentlemen, and practised by both sexes in the school-room together, it must needs change its name. So *calisthenics*, having *beauty* and *strength* in its etymology, the very qualities to be cultivated, very appropriately and very politely bows *gymnastics* out, and gracefully occupies his vacated seat.

Would you have a visible illustration of bodily exercise profiting a little, then compare the robust farmer with the emaciated form of the sedentary student, who, with but little exercise, has spent years in racking his brain over the occult mysteries of science, and has "burnt the midnight oil" in extracting the roots of highly involved powers of algebraic quantities, and exhuming the abstruse and hidden roots of Greek and Latin verbs, until "his shadow has grown less," and it will not be necessary to place the specimens on a Fairbank's platform, to determine where the bodily exercise has

profited, even a little, in their relative avoirdupoise.

Now try the blacksmith, the muscles of whose arm have been exercised in wielding the hammer. Trust your hand in his and allow him to give you a good fraternal squeeze, of persistent duration, until the vice-like pressure elicits from you a note of admiration! and you have a feeling sense of the truth that "bodily exercise profits a little," if not more.

Development of brawn and power in the blacksmith's arm being now assured, just change the programme a little, and compare his *right* arm with his *left*. That arm that swings the hammer day by day, and year by year, brings to its muscles a stronger flow of blood, with larger supply of nutriment, and fuller development than is ministered to the other arm; and the superior development of the dexter muscles over the sinister, is susceptible of ocular demonstration, and *Dextra* and *Sinistra* declared unequal competitors.

Bodily gymnasia being one of the activities essential to healthy physical development, the Author of Nature has wisely implanted in the young a desire for muscular activity. Watch the little babe as it lies upon its back, with pedal extremities elevated, and feet and hands actively engaged in a fantastic game of juvenile gymnastics. The growth of its little limbs and muscles, will soon present them as living witnesses to testify that in its case "bodily exercise is profitable for a little" child.

Physical Gymnasia is now sufficiently sustained, and its status vindicated, and our obligation to "present our bodies a living sacrifice" shown to be "our reasonable service."

The transition to *spiritual gymnasia* will now be quite easy. Peter says: "As new born babes desire the sincere milk of the word that ye may grow thereby." 1 Pet. 2: 2. As exercise and food are necessary for growth, God has implanted in the infant a desire for both. With this as the basis of analogy, the apostle transfers the teaching into the realms of the spiritual. As the child desires the natural physical pabulum, its mother's milk, so the spiritual wants of the new-born babe in Christ desire the milk of the word, which, with the spiritual exercise, or gymnasia, is in order to *growth*. The preparation and panoply and drill exercise in this spiritual gymnasium, we find in the apostolic instructions, in their epistles to the churches.

As this has the promise of the life that now is and of that which is to come, after enjoying all its benefits here, we launch into the unseen hereafter. Hence the leader, or "Captain of our salvation," passed through the portals of death into the unseen world and returned. He has given us a guide book, and those who practise godliness, according to its instruction, through this life, have his promise, not only here but hereafter. While those who ignore the guide-book, the word of God, will be like the man who despised the use of the guide-book in travelling in a new country, and trusted to his genius and was lost.

Peter gives a list, or brief curriculum of the Christian activities in the spiritual gymnasium, in which godliness is a prominent factor, and intimates that the diplomas of those who graduate in the full course of that curriculum, will be a passport into the everlasting kingdom, or as Paul expresses it in our text, a promise of the life that is to come.

But Peter's curriculum is not an optional course, in which each student may select or neglect at pleasure. It is very explicit, and after enumerating the activities, he says: "For if ye do these things ye shall never fall; for so an entrance shall be ministered unto you abundantly into the everlasting kingdom of our Lord and Saviour Jesus Christ." 2 Pet. 1: 11.

In this, the *do*, or practice, stands out in unmistakable prominence. Let it be borne in mind that these activities are all located in this life, and to be performed while in the body, but their accumulated interest stands on deposit to our account in that "promise of the life to come," "that we may lay hold on eternal life."

RICHMOND, MO.

MODERN PHILOSOPHY AND CHRISTIANITY—No. 3.

BY PROF. JAS. W. LOWBER, M.A., PH.D.

There are two extreme philosophical tendencies at the present time, which number among their advocates a great number of metaphysical students. I mean the theories of Nescience and Omniscience.

The theory of Nescience, or Positivism, was chiefly founded by Auguste Comte, who restricts science to physical phenomena without inquiring into ultimate causes. He strictly excludes from his philosophical system metaphysics and theology. This writer insists upon a serial order of evolution, each through three stages, viz.: the theological, the metaphysical, and the positive. Mr. John Stuart Mill, the most able disciple of their school, enlarges his classification of the sciences so as to include psychology and ethics. Herbert Spencer, with the logic of Mansel, supports the same philosophy, but claims that the historical law of the genesis of the sciences has not been found. According to Lewes, a disciple of the same school, the Unknowable Absolute of Spencer, is a monotheistic development of fetishism; and he claims that some of the metaphysical sciences admit of the positive method, and proposes the term *metemphysical* to distinguish the unknowable from the knowable region of research. The theory of Nescience is open to the charges of Materialism and Atheism. It regards Christianity as a remnant of the mythological age, and makes no provision for a supernatural religion. It contradicts some of the plainest facts of history and experience. It is a fact that Christianity has made its greatest progress among those nations which have given the most attention to the physical sciences. America and England are devoted to the inductive method, and they are, at the same time, the great Christian powers of the world. Metaphysics flourishes in positive France, and theology is advancing in metaphysical Germany.

All the phases of Positivism embrace Empiricism which claims that all our knowledge comes from experience through the senses. It is not surprising that such a narrow theory banishes God and immortality from the universe. We can not smell, hear, touch, see, or taste God, self, cause, or substance. From the testimony of sense alone, we can not legitimately infer the existence of these four, or the reality of either efficient or final causation. Positivism is intensely negative as it can not

go beyond the domain of the senses and penetrate beneath the surface of things. It contradicts the first principles of science, which are as old as Democritus, viz., that matter is both ingenerable and indestructible. These maxims are not given by experience; for without them, experience would be meaningless and teach us nothing. We must assume these principles, or a compound substance can not be resolved into its elements and then be reconstructed from these elements. The underlying principles of all the sciences transcend experience. The ultimate ground of Induction is to infer from the known phenomena, the unknown about which we have no experience.

The history of philosophy is largely a record of the oscillations of the human mind between extreme positions. The theory of Omniscience is another great swing of the pendulum. While the theory of Nescience has an extreme materialistic tendency, that of Omniscience has an extreme transcendental tendency. Theodore Parker, who was a disciple of the Tübingen school, claims that man has (1) an instinctive intuition of the fact of the Divine existence; (2) an instinctive intuition of the existence and authority of the moral law (3); that he has an instinctive intuition of his own immortality. While this theory claims to be religious, it supersedes the necessity of a Divine revelation. It regards Christ and the Bible as the idols of modern times. The fundamental principles of Absolutism are untrue. Theodore Parker confounds instinct and intuition. Intuition alone does not give man a knowledge of the Divine existence. The existence of God is evident, but not self-evident. It is not true that intuition gives man a knowledge of a future life. Man has an instinctive anticipation of a future state of existence; but it requires a revelation to bring life and immortality to light.

A true Christian philosophy solves the great problems of the Divine existence and of a future life. It possesses a revelation of the personality and character of the Infinite, and it strictly avoids the extremes reached by the theories of Nescience and Omniscience. It throws much light upon the doctrine of the resurrection and a future life. The particles of the body, according to chemistry, change every four or five years. The heart of a man changes in thirty days, and the heart of a woman in less time than thirty days. A true philosophy insists upon the existence of the spirit as well as the body, and that the body conforms largely to the character of the spirit. The body, when raised, will be exactly adapted to the spirit which Jesus will bring with Him.

LANCASTER, KY.

CHARACTERISTICS OF THE FORCES OF NATURE.—No. 2.

BY ISAAC HOFFER, Esq.

The large number and great variety of mineral formations, plants, and animals would indicate an equally large number and great variety of forces at work in Nature's activities; but a close examination will show that there are two general modes of action manifested in nearly all these activities—the one diffusing and impelling and the other gathering and uniting. These two modes of action

can, however, not select, form, and vitalize, and therefore some other forces must either control and utilize them, or the other forces must have the same diffusing and uniting modes of action in addition to the selective, formative and vital.

It is a question too whether these two general modes of action are the operations of two distinct forces, or whether they are only the positive and negative actions of the same force. It appears to me that forces generally must have each a positive and negative action. The absence of light is darkness, and the absence of heat is cold. Electricity and magnetism have positive and negative poles, and exhibit repulsion and attraction.

Light, heat, and sound are considered, by Scientists generally, as modes of motion proceeding from projecting powers.

This projection theory is so improbable that the luminiferous ether, already referred to, had to be invented, and placed in space as a medium through which to convey the projected light and heat of the Sun to the earth.

The attraction of the Earth and the Sun, as has already been shown, would seem to make it impossible for a material ether to remain in space; but even if this was possible, the well known fact that matter is not a medium of conveyance for other matter, but a resisting obstacle, and the further fact, that if light and heat, as Prof. Tyndall holds, are both material substances, and therefore subject to the laws of affinity and attraction, they would be drawn together and united, leaving the ether theory without a shadow of probability to rest on.

A mode of motion, or a mode of action cannot be projected. The movement of a man's hand cannot be *thrown* across a stream, but it can be conveyed across to the eye of the observer on the other side by light, or the force which conveys light. The sound of a beaten drum is not projected or thrown out but is conveyed away in every direction, not by the atmosphere, but through it and against its resistance, by some force.

In telegraphing, the mode of action by the operator's fingers is conveyed through the wires by electro-magnetism, and this mode of action can be received, as it was given, at any point of the wires.

In telephoning, sound is conveyed in the same manner, and by the same force, as motion in telegraphing.

In photographing, light conveys and transfers a perfect representation of an object on the prepared plate or paper.

Forces therefore are not mere mediums through which modes of motion may be impelled or passed, but *they are mediums for the reception, conveyance, and transference of modes of motion, actions, or representations of objects.*

Rapid disuniting action of combustible materials produces light and heat, friction produces electricity, chemical dissolution of metals produces electro-magnetism, and a sudden jar or vibration of sonorous bodies, or a concussion, as the clapping of hands or an explosion, produces sound. In all these cases the movements show the same formless mode of action—simply motion and resistance to motion—as are manifested in the production of minerals, plants, and animals. This formless mode of action seems to be the fundamental mode of

the interaction of force and matter, in all the activities of Nature; and seems to indicate the existence of a universal and all-pervading force with impelling and attracting—positive and negative—actions. The mode of action that produces heat seems to be also only motion and resistance to motion, but as heat is only given out by some material substances and not by others, is irregular and unequal, it cannot be a universal and all-pervading force; for no force that is confined and limited can permeate all matter and fill all space. Heat no doubt modifies the universal force, but the prevailing mode of action of any force, however modified by other forces, is not changed as is demonstrated in telegraphing where the motion of the operator's fingers are conveyed and reproduced, the same as the light and heat of the Sun are conveyed and reproduced on the Earth, and yet the mode of electric motion is not changed. The formless mode of motion manifested in the activities of Nature is, therefore, clearly the evidence of a universal force that permeates all matter and fills all space, as electro-magnetism permeates and fills the wires in telegraphing. There is no place where it is not present, either in a potential (non-effective) or active (effective) state. The potential state of this universal force appears to me to be the only uninterrupted and undisturbed general action, for then no effect can be produced, and no action can be manifested; and the active state is when the regular action is disturbed by the interaction or interference of some other force. This universal force is the medium by and through which the light and heat, or rather the mode of motion of the light and heat of the Sun is conveyed to the Earth, and is here reproduced; and it is only when the heat-producing motion is imparted to this force that its interaction with matter can take place. In space the positive or impelling action predominates, and in matter the negative or attracting action.

This explains why the attraction of two bodies diminishes with the increase of distance between them; for where the positive impelling action prevails, the negative attracting action cannot prevail.

Chemical and vital—or productive—forces are perpetuated in material substances, and remain in a state of inaction until the diffusing action of the universal force with the heat-producing motion has reached the proper degree of diffusing to start the chemical and vital actions. Affinity, chemical combination, and crystalization cannot effect matter unless in a properly diffused condition.

Vitality can only be brought into action and maintained by the proper and continuous diffusion of matter, and of material substances. A seed will not germinate and grow in the ground until a sufficient degree of moisture and heat are supplied. Productive forces, therefore, are dependent upon special conditions for their interaction with matter, and have no power to bring about, control or change those conditions.

Light, heat, electricity, magnetism and sound, are also closely connected with matter or material substances, and must bear some relation to chemical and vital forces; for the material substances characterized by these latter forces manifest, according to their particular characteristics, one, or another of the former forces. These former forces, there-

fore, must have become, in some form, part of the material substances, or else their actions could not be manifested in the dissolution or disturbance of those substances.

The quick dissolution of combustible materials could not produce light and heat, if light and heat were not present in some form.

Forces that are perpetuated in material substances and are modified by their interaction in these substances, have in this modified form *their only sphere of action in matter*. It is true that motion or action without resistance can produce no effect—the motion of the hand moves nothing unless it meets something—but it is equally true that electricity will not pass through a vacuum, and that light, heat, electricity, magnetism and sound are not manifested, each, in all matter, but each permeates or is present only in some kinds of material substances, and diminish in power or intensity with the increase of distance, showing clearly that they are *localized forces*, and therefore cannot permeate all matter and fill infinite space. It is therefore evident that neither of the productive nor any other localized force can be a universal and all-pervading force.

Light, heat, and electro-magnetism, and to some extent electricity, are produced by interior actions in material substances, disuniting and diffusing the molecules; but sound is produced by the movements and actions of material bodies without any diffusion of the molecules except in a few instances, as in explosions.

Sound is not a movement of air particles in any form, as is generally supposed, or else it could not be produced and heard under water, or heard at one end of a bar of iron or piece of timber when struck or scratched with a hard substance at the other end.

Moving air, however, is perhaps the most common agency through and by which motion is imparted to sonorous bodies. In the human voice air is the agent that moves the vocal chords, but it cannot be the thing that constitutes the sound; for air cannot be conveyed from Chicago to New York through wires. Air particles, or corpuscles of any other material substances, cannot be passed through solid iron wires or bars. It is not the motion that proceeds from an impulse and moves on in one direction, but the re-acting motion or concussion, caused by resistance to the impelled motion—the action and re-action of sonorous bodies or substances—that gives the mode of motion which produces sound. The cause of this resistance, and consequent vibratory motion, is within the sonorous body or substance, and *is the effort of the incorporated or permeating force to restore these bodies or substances to their most substantial form and position*; or to restore the equilibrium of the disturbed actions of the permeating force. It is the tension—the *impressible position and recovering power*—in the prongs of the tuning fork, in the string, in the reed, in the horn, and in the vocal cords that receives and resists motion, and thereby causes the vibratory action which produces sound, and not the resistance of air or outside substances. The force, therefore, that causes sound-motions is within the sonorous substances, and the sound is produced within them, and not in the surrounding atmosphere, or any other outside substances.

Sound is the *peculiar mode of motion which the disturbed action of the incorporated permeating force in sonorous substances imparts to*

the universal force that permeates and fills all material substances. This peculiar mode of motion is imparted, either by the interaction or the interference with the universal force, and is in this form, the form which the sense of hearing perceives as sound—conveyed (not propagated by air particles) through the atmosphere in every direction, and through all other sound-conveying substances, and is innumerable presented and reproduced by this universal force, in the same manner as sound is received, conveyed, and reproduced in telephoning.

LEBANON, PA.

SPIRITUALISM EXPOSED.—No. 3.

BY CAPT. R. KELSO CARTER.

Charles Foster, now an inmate of a lunatic asylum, was the most successful medium that ever traveled through the United States. About the year 1872 he visited Philadelphia, and created a furor by his startling manifestations. A stranger would be confronted by the names of his deceased friends, messages were delivered from them, questions answered, and sometimes their initials made to appear in blood upon the medium's wrist, without any means appearing whereby Foster could know the names, initials, or even the questions to which he returned the answers. Many a convert was added to the ranks of the deluded Spiritualists through the performances of this man, and the most astute skeptics were startled and utterly nonplussed. When I enjoyed a seance with Foster I was entirely ignorant of slight of hand. I came away with a vivid recollection of what I *saw* in every detail, and long afterward this recollection served me so well that every illusion was thoroughly sifted and explained. Taking seats around an ordinary table in a room of the Continental Hotel, we were requested to write the names of several dead people upon strips of soft white paper, and to fold these up and make a promiscuous pile of them upon the table. Foster did not see us write these at all, but kept his back to us. He then carelessly fingered the pile of papers, which were totally unrecognizable even to us, and pressed one by one to his forehead. Suddenly he turned to one side and addressed a supposed spirit close at hand, asking him if he would reveal his name, &c., declared that he received an affirmative reply, and suddenly announced the name,—one of those which I had written,—and almost instantly, with a quick glance around, said to me: "He comes to you, sir; ask him a question." Not a little surprised, I wrote a question, handed it to Foster, who pressed it to his forehead, dropped it on the table, talked again with the spirit, and gave me the question with a general reply. This performance never failed with anyone. The explanation is exceedingly simple. When he was raising the paper pellets to his forehead he "palmed" one of them, or held it in the hollow of his hand, stuck between two fingers, and when he suddenly turned and addressed the spirit at his side, his right hand fell into his lap beneath the table, where he unfolded the paper on his knee, and, while asking for the name, read it easily. Crumpling the paper again in his hand, he turned quickly and gave the name, whereupon the involuntary flash of

surprise in my eyes instantly enabled him to say, "He comes to you, sir." My question was read in the same way precisely, the pellet that was dropped on the table being another one he had in his hand when he took mine from me. After giving the name, he pretended to search amongst the pellets for the proper one, and presently tossed one to me, which, of course, I found to contain the name of my spirit. The simplicity of the whole operation is best attested by the following fact:—

Once when talking with a friend, a professor of natural science, I offered to give him a seance, and then and there went through with the above, using stiff paper that rustled dangerously, without his detecting a single deceit, and I had never practiced the performance at all. Yet for this easy lying Foster received five dollars from every individual that visited him. He varied his performance somewhat, of course. Occasionally he would ask the spirit to tell a name that had not been written, and finding some difficulty would appeal to a card containing all the letters of the alphabet. The spirit was required to rap when the correct letter was touched, and with an eye upon the victim, Foster would place the pencil on a letter and ask of the spirit: "Is this the letter?" On the principle of the boxer, who can always tell from the eye when his opponent intends to strike, he could nearly always detect the faint flash of intelligence when the correct letter was reached, and of course the raps would follow. His greatest display of shrewdness and skill were shown as follows: My friend and I were in semi-uniform, and he mistook us for railroad conductors. He therefore ventured the remark that some one came to him, whom we had known, and who had been all crushed to pieces in a railroad accident. I thought vividly of a former cadet who was once killed in that way, whereupon he saw the gleam in my eye, and said: "You know him; write his name." I wrote it upon the table, when he called out the name correctly before I handed the paper to him, having read it upside down from the motions of my pencil in writing, aided by a glimpse of the inverted letters. To show how completely he depended on the flash of the eye, I recall that when I asked a question of a spirit, the answer to which I did not know, he was totally unable to fix on any letter or hint at a reply, and finally gave it up in disgust.

Foster's greatest hit, however, was the famous blood-writing on the arm. Like all other wonderful tricks, it is very simple of explanation. Sometimes he wrote a letter on his arm in red color, waited till an individual gave him a name which contained this initial, and then wetting his finger and moistening the letter unobserved, he suddenly exclaimed that the spirit had written his middle initial on his arm in blood, at the same time pulling back his sleeve and exhibiting the startling fact.

But when he visited a large city and wanted a first-class puff, he was a little more genuine. Having obtained the initials of some deceased worthy by the means already described, he waited for a favorable moment, when the victim was busy writing, to deliberately scratch upon his left wrist with a sharp diamond ring, the letters in question, when he displayed to the amazed individual the letters *in actual blood* upon his arm. It is needless to say that this was not done often.

We have given in these three papers a faith-

ful representation and explanation of the great swindlers whose "scientific facts" have amazed and frightened learned professors. In closing we lay down the broad assertion that no spiritualist, living or dead, ever did submit his so-called tests to the reasonable conditions of those whose education had really made them competent to watch him. And we would add the following offer: Whenever one of these gentry will visit the Pennsylvania Military Academy and submit his tests to the observation of Prof. Powell and myself, we agreeing not to spring any trap upon him, but merely to watch carefully everything that is done; if he can perform *any test whatever* when we dictate the conditions, or if we fail to explain any test whatever performed according to his conditions, we will in either case give him the benefit of an extensive advertisement of the facts in *The Microcosm*.

PA. MIL. ACAD., May, 1883

SCIENCE AND THE DELUGE.

PROF. W. H. SLINGERLAND, PH. B.

The relations and limits of the natural and the supernatural, are and must ever be questions too abstruse and mysterious to be fully answered by humanity. We shall never, at least in this life, be able to define just what things occur, or have occurred, under the ordinary working of natural laws. By this I mean that many phenomena are so little understood, that man cannot say decisively of them,—"they occur naturally," or, on the other hand, "they are miraculous or supernatural." In this condition of uncertainty, man is at fault either in his knowledge of the *fact*, or in his comprehension of the *laws of Nature*, or in both. By the laws of Nature or natural laws, we mean God's laws or methods, by which He ordinarily governs Nature. By things occurring *naturally*, we mean in accordance with these laws or methods. By things occurring miraculously we mean things done by the use of some power or force not generally at work, or acting in accordance with some law not generally followed, which force or law is for the time superior, and overcomes or supersedes the ordinary.

God, the Creator and Preserver of all things is of course back of both, and operates through both. But so far as we know, the second has only been used by Deity in attestation of Himself or His religion. But this same attestation of Divinity and of religion, may also have been made, sufficiently and decisively, by the simple action of what we term natural causes acting under natural laws. In all God's dealing with us, He seems to have thus used natural means whenever they were adequate to secure the end sought. Only a few times in the history of the race has the Hand Divine been manifest in miraculous action. A few scores at most are all that we can find recorded in Holy Writ, and all others must at least be regarded with extreme suspicion. In the Bible, too, we find references to some things which at first sight appear to have happened by special miraculous agency. Some of these have been shown to have occurred according to the laws we call natural; but which evidently served the Divine purpose just as well as if they had called for

some special and extraordinary manifestation of His power.

We then will *naturally* suppose that events take place without special interposition, unless such is expressly stated, needed, or implied.

The deluge is one of these facts recorded in the Bible. It is admitted by nearly all scientists that there has been a deluge, but so far none have been able to account for its coming on scientific principles. By many it has been considered an indubitable miracle, and many more have tried to weave a satisfactory theory based on natural laws. And, surely, since God *generally* works according to these "natural laws," we ought first to see if the deluge can be thus accounted for before considering it a miracle. I said, "so far none have been able to account for it on scientific principles." But can it be done *now*? There is at least one man who thinks it can.

This man is Isaac N. Vail, of Barnesville, Ohio. I lately received a little book from him on this subject, and am quite favorably impressed with some of his ideas. Believing that the readers of the *MICROCOSM* would be interested in his theory, I would like to give a synopsis of it, that we may all, in our search for truth, have the advantage of his suggestions, and, if his theory prove fallacious, that some one may have the opportunity to decisively overthrow it. Let me first give the theory in brief, and then give a few quotations from Prof. Vail's book.

When God said: "Let there be a firmament in the midst of the waters, and let it divide the waters from the waters." He divided the primeval ocean into two or more parts, which were separated by the firmament. Now the Hebrew word *Rakia*, translated firmament, means simply an expanse, and the idea was the same as that of our sky or atmosphere.

Then the primeval ocean was partly above and partly below our sky or atmosphere, after the command first quoted. But how could the atmosphere be a partition between two oceans? Look out into space. Observe the planet Saturn. "In addition to his eight moons, three stupendous rings revolve about him, two composed of meteoric, and one (the inner) of aqueous matter. There, 19,000 miles from his surface, revolves an ocean 8,000 miles broad, and 1,000 miles thick; an ocean *above* Saturn's *firmament* or *atmosphere*." Prof. Vail then naturally passes to the view that once such an oceanic ring surrounded the earth, and is what is meant in Genesis by the "waters above the firmament." Those below were on the earth, for it was said, "Let the waters *under* the firmament be gathered together, that the dry land may appear." The natural cause which was instrumental in this separation of the waters was the native heat of the earth, which originally expelled all the waters from the earth's surface, and then, during the gradual cooling of the planet, the inner rings or oceans fell first to the surface, and last of all the ring which produced the "deluge." In support of this idea of the rings' final fall to the planet, Prof. Vail says: "The most eminent astronomers now living, claim that both Saturn and Jupiter are to-day repelling, by their native heat, their waters into space. Both are characterized by the presence of aqueous belts, in double or multiple layers, that must successively condense and fall as oceans upon those planets, when the heat that now holds them in

space ceases to act." Such is a brief outline of the theory. The author presents quite an array of confirmatory facts. Also he claims that his is the only theory harmonizing with and fully explaining all the references in the Bible bearing upon the subject. If the references to Saturn, and his deductions from these facts in regard to the future of that planet are true, there is at least a strong analogical argument in favor of the theory. Now let me quote a little more fully on some of the main points. In reference to the earth's aqueous belt he says: "These waters, originally formed *in* and repelled from that great laboratory, the primitive earth, skirted the boundaries of a vast and remarkable atmosphere, with which the chemist, the geologist, and enlightened astronomer are familiar. Well, such an object must have had a name. Mark, that the waters on the earth were called *seas*. The alone remaining Hebrew word, which could refer to the waters, we render the 'Great Deep.' It was so called because *all mankind* formerly believed that the clouds were *fed* from above." Turn now to the example before us in our fellow-planet: "Critical observation upon Saturn's aqueous ring shows it to be constantly undergoing important changes. Some scientists have even announced that portions of it have at different times become detached from it, and fallen into his atmosphere, floating away like huge clouds and uniting with his watery belts. A belt of vapor or water, revolving in the outskirts of the atmosphere of a planet, must inevitably lose its independent rotary motion, and thus gradually sink toward the attracting central body. Thus there is a perpetual tendency of such belts as we observe in the solar system to fall, and fall they all must in time. There does no longer exist in the earth an appreciable repelling force, caused by the native heat of that body; and as a legitimate consequence its exterior waters have fallen." Turn now to the Mosaic record and read: "For yet seven days and I will cause it to rain on the earth 40 days and 40 nights, and every living substance that I have made will I destroy from the face of the earth." Our author now argues the utter impossibility of such a rain from ordinary clouds under the ordinary laws of evaporation and condensation, of heat, motion and gravitation; and while acknowledging that the "Creator of heaven and earth, who holds the oceans in His palms and balances the universe as upon the tip of His finger, can do any and all things," denies that it is necessary to believe the waters of the deluge came from the beds of principal seas or from the atmosphere. His belief is, of course, that the waters came *through* the atmosphere from the outer ocean, on their way to the surface of the earth. "Again we open the sacred volume and read: 'In the 6th hundredth year of Noah's life, in the second month, on the 17th day of the month, the same day were all the fountains of the Great Deep broken up, and the windows of heaven were opened,' and the flood was upon the earth 40 days and 40 nights.' I ask the critical student to take into consideration the universal belief of mankind, when those waters fell, or if he choose when that declaration was penned, viz.; that all falling waters came from a great deep, situated above the clouds, beyond the solid shell of the firmament, through imaginary windows, and then reconcile to it, if he can, the modern idea that the deep here referred to was the ter-

restrial ocean." "A multitude of facts prove beyond a doubt that the ocean was not at all referred to." But I must not quote any more. You have the outline of the theory. Prof. Vail supports it with a formidable array of confirmatory facts. The ideas he presents are intensely interesting to me. I trust the readers of the *Microcosm* will be equally interested in them. My only object in presenting this outline is to advance the interests of true science. Others may be able to add new facts and arguments to support the theory, or on the other hand, may be able to overthrow it. At any rate if thought and inquiry are awakened, we shall all have taken one more step up the ladder of progress.

[We had an article in type from Prof. Vail's pen bearing upon the foregoing discussion, but owing to Prof. Slingerland's very interesting synopsis, we have deferred it till next month. —Ed.]

THE MOTIONS OF THE PLANETS.

BY REV. PROF. S. WOOD.

It is well known that the sun is moving in space, but whether this motion is describing a right line, one of the conic sections, or one of the spiral forms, is not known; but for the purpose of this article, it is not essential.

The velocity of this motion is estimated by Prof. Young, in his recent lectures on astronomy, at from 10 to 30 miles per second, with the greater probability, from analogy, in favor of the larger number. The earth in her revolution around the sun, as a fixed center, moves at the rate of 18 miles a second. Therefore, if the sun is moving through space at a greater speed than eighteen miles per second, the earth in her progress does not, at any time, make a retrograde motion in space, but is always moving in the same general direction, in a slightly spiral line.

The real motions of the planets, in space, do not describe any of the conic sections. If the planets all passed the sun, and again fell behind it in the same plane in which the sun is moving, their paths would be serpentine; but as they move in different planes, their paths are more or less spiral. This can best be illustrated by the path of the moon around the earth. The earth is in the meantime traveling around the sun, which may, for this illustration, be considered a fixed center; the path of the earth would be an ellipse, with an average radius of 92 millions of miles. The average distance of the moon from the earth is nearly 240,000 miles, and it crosses the earth's orbit every 13 degrees with the sun as a fixed center of the earth's orbit. It only remains to be shown that the chord of an arc of 13 degrees, with a radius of 92 millions of miles, is more than 240,000 miles from the center of the arc, to prove that the path of the moon is always concave towards the sun; therefore, the moon's path does not fall within one of the conic sections.

But as the sun is moving through space with great velocity, taking all the planets and their satellites with it, the real motions of the planets, satellites and comets cannot describe any of the conic sections; and yet, as by their *rotative* motions they do describe such figures, all the apparent elements of their orbits, from

the sun as the center, may be calculated by conic sections.

A knowledge of these facts, so familiar to astronomers, is valuable to us so far only as they may assist us in comprehending the causes, and in understanding other phenomena. The sun is traveling through space, urged by some motive; whatever that motive may be, it is supposed to act equally upon all parts of the system; that is, upon each planet in the system. The same attraction that pulls the sun forward, acts also upon the earth, and if there were no other motive, the progress of the earth would be uniform; but it has another very powerful motive, constantly acting upon it, namely, the attraction of the sun, so that when the earth is behind the sun, its motion and momentum are continually increased until it passes the sun, when its momentum still urges it forward with decreasing velocity, on account of the attraction of the sun, until it again falls behind; but it is not necessary to suppose that the earth makes a retrograde motion, in reference to the direction in which the sun is moving. Each one of these changes of relative position, in reference to the "central" body, is called an orbital revolution. It will be seen that the rate of motion, in the orbit, will depend upon the attraction existing between the central body and the body revolving. This is supposed to be influenced by mass and distance and possibly by density. If all the planets were equal in mass and density, the velocity of each in its orbit would depend upon its distance from the central attracting body, governed by some law (not well understood), called "squares of distances," as is seen in the solar system of primary planets. The orbital velocity of Mercury, whose distance from the sun is equal to 82 times the radius of that body, is 105,330 miles per hour; while that of Neptune, whose distance is 78 times as great, travels but 11,958 miles per hour.

It is the same with the satellites: the nearer to their primaries, the more rapid the motion; as is the case with the satellites of Jupiter. The first, whose distance from the center of the planet is equal to 6 times the radius, has a velocity of 37,700 miles per hour; the second, whose distance is 9.6 times the radius, is 30,070 miles per hour; the third, distance 15.4 times the radius, is 24,000 miles per hour; the fourth, distance 27 times the radius, is 18,000 miles; while the satellites of Mars, as stated by Prof. Asaph Hall, are distant about 3 and 6 times, respectively, the radius of the planet; the first revolves in its orbit in 7 h. 39 m.; and the second in 30 h. 15 m.; the first at the rate of 7,380 miles per hour; the second at 3,065 miles per hour.

It will be seen that the velocity not only depends upon distance, but upon the mass of the central body. And as this law applies alike to primaries and satellites, it is evident that all are urged by the same force: *gravity*.

The reason that the primaries do not rush into the sun, and the satellites against their primaries, is, that they are prevented by this law, that attraction is inversely as "squares of distances," and velocity inversely as "cubes of distances," so that each planet finds its equilibrium and keeps it within what is called its eccentricity.

That electricity, magnetism, or corpuscular emission from the sun, may have more or less influence in determining and fixing the dis-

tance of each planet from the sun, and in affecting their rotary motion (even if it can not be proved,) need not be doubted. We see something of the effect of these influences in the action of comets, in their return to the sun; as they approach the sun, the tail increases in length, as if driven off by some repelling medium; and as the comet approaches its perihelion, and crosses the path of the sun, in front, the tail is driven around with such velocity as to continually point from the sun with but the slightest blush of a curve. In the case of the comet of 1843, the tail was supposed to be 100 millions miles in length, and it made the sweep of 180 degrees in three hours.

The comet of October, 1882, performed a similar feat, passing from one side of the sun to the other in three hours—the head of the comet moving at the rate of 300 miles a second, with the tail whisking around in line, as if driven off by electrical repulsion.

IS MAN'S RELIGIOUS NATURE AN EVOLUTION?—No 3.

BY REV. JOS. S. VAN DYKE, A. M.

COUNTER REASONING.

In weighing the testimony presented by Lubbock and others, it is well to bear in mind that travelers, especially the hasty, may easily be mistaken; that some are exceedingly careless; that others may entertain strong prejudices; that in some instances even the most cautious may be deceived, for there are tribes, particularly in Africa according to Livingstone, who consider it the most horrible sacrilege to acknowledge to strangers their faith in the existence of a Supreme Being. Even to hint at His attributes is regarded as likely to entail the most terrible penalties.

Even suppose it has been proved, or shall be proved, that some savage tribes have no religion whatever, does it follow that "such was probably the condition of primeval man?" Certainly not: for unquestionably the majority have some form of religious faith. Why infer that the few are more likely to represent the condition of our ancestors than the many are? Is it easier to believe that the many have evolved religion than that the few may have lost it? Is improvement in religion more frequent than deterioration? Is religious faith one of the few things which man has never lost? The fact that man, whether savage or civilized, both collectively and individually may be destitute of religion, has as much weight in proving that human nature may sneeringly disregard its highest interests till degeneration ensues, as in proving that man's aboriginal condition was not utterly devoid of spiritual emotions. Certainly the loss of these, so far at least as they may be operative for good, is not a thing so infrequent as to render it extremely improbable that any barbarous tribes should have abandoned them. Manifestly the appeals of false systems of faith to man's hopes and fears are insufficient to keep the baser nature in subjection. Experience has shown that in many instances even the claims of true religion have been inadequate to prevent the vicious from spitefully disowning them. Are we not justified, therefore, in concluding that reason sanctions the declaration of Paul, made in re-

ference to the Gentile world, "Even as they did not like to retain God in their knowledge God gave them over to a reprobate mind"?

It is conceded that among savages the belief in spiritual agencies is almost or quite universal. This is fully granted by both Darwin and Lubbock—indeed, is strongly asserted. Does not this yield the ground upon which their tottering argument is based? No one claims that savage races are civilized nations. Of course their beliefs must correspond with their condition. Degraded in morals, and degraded in intellect, could they be otherwise than degraded in religion? Does the mere fact that there are degraded systems of faith prove that man's progenitors were irreligious savages? Then the simple fact that there are ennobling systems of faith is still more potent in proving that the first man was an enlightened theist. The former argument proceeds upon the assumption that because the religious element is feeble or perverted in savages, therefore it had no existence in primitive man; the latter bases itself upon the fact that as the religious element is universal, existing even in degraded barbarians, and exceedingly powerful in intelligent nations, therefore it must have existed in this form in the person of man's progenitor. If the belief of savages in some mysterious being or in some unseen influences establishes the theory that man's primeval condition was one of irreligious savagery, then assuredly the existence among civilized nations, and especially among the ancient Egyptians, Assyrians and Tyrians, of elevating religious conceptions, proves that the first man was an intelligently religious being. Indeed, since spiritual ideas prevail, in many instances, even among savages, they must have descended from pious ancestors.

It is quite evident, however, that the concession in question was intended to look in an opposite direction. It was manifestly designed to prepare the way for the reception of this proposition, "belief in spiritual agencies would easily pass into the belief in the existence of one or more gods." It was necessary to discover among barbarians a germ from which religion might be developed, for it is somewhat difficult to understand how evolution can produce entirely new faculties, though this is a necessary part of her arduous task. The existence among rude tribes of an indefinable dread of some mysterious being aids our opponents in marking one stage in the journey passed from apedom to spiritual manhood. It assists in producing the conviction that during the period prior to the development of the religious nature, no agencies tending to its production were needed, since in a comparatively few centuries an undefined awe has affected changes so vast and ennobling. If we can be induced to admit that theism has been developed from superstition, it will be easier to admit that superstition has been evolved from an animal's respect for superior power and intelligence—thus the entire religious nature, complex in its character and having vital connections with all man's faculties, will be accepted as a gradual evolution. But does belief in spiritual agencies easily pass, unassisted by instruction, into the belief in the existence of one or more gods? What savage tribe unaided by instructors from without, has ever abandoned its superstitions for an intelligent faith? What

tribe has gradually worked itself into polytheism, and thence into monotheism?

The feeling of the barbarian toward superior beings is, we are told, like that of the horse or the dog towards his master. Until this has been proved no notice need be taken of it; when it has been proved Christians will have fresh occasion for glorying. Assuredly they will be justified in rejoicing exceedingly that Christianity has such marvelous potency, being able not merely to evolve theism out of atheism, but capable even of developing the doctrine of the soul's immortality out of the vague conceptions of miserable savages that possibly the cow, the tree and the house, as well as man, may continue existence upon the sunny plains of Bolotoo; nay, being even equal to the task of teaching the Christian code of morals to those who in their primitive state are entirely incapable of distinguishing right from wrong, and who cannot count more than three. That our opponent's theory furnishes the means of flattering human nature can scarcely be denied; and its advocates have employed it, in some instances quite liberally.

In the face of incontrovertible facts, have we the right to maintain that man has been continuously advancing in religious knowledge? Most investigators say, No. Max Müller affirms, "If there is one thing which a comparative study of religion places in the clearest light, it is the inevitable decay to which every religion is exposed." An unbiased examination of those which have prevailed since B. C. 2,000 will evidence the extreme difficulty of believing that the Christian's ennobling conception of Deity is the mere product of human thought. That religions with few if any exceptions, have deteriorated is an undeniable fact; that they have become with successive centuries more elevating in their nature, more spiritual in their conceptions, purer in morality and less meaningless in the ceremonies employed certainly has not been proved. On the contrary it can be shown, we believe, that the earliest religions of which traces exist were comparatively pure, highly spiritual and simple in their ceremonies—were forms of pure monotheism. That such was the case in ancient Egypt has been successfully proved, in the judgment of competent persons. As we go backward through its successive dynasties—through the New, the Middle and the Old empires—till we reach the remote period when Upper and Lower Egypt were consolidated into one vast empire under Menes, we discover more spiritual forms of worship till we reach pure monotheism. The assertion that civilized man has passed successively through fetichism, polytheism, etc., is incapable of proof; nay, it is in the face of well established facts.

"Religion once was natural,
Priests made it mystery, offerings made it
gain,
To roast fat oxen alters next were reared,
And priests ate roast meat while the people
starved."

DOES GEOLOGY IGNORE A CREATOR?

BY REV. J. J. SMITH, D. D.

There is a very wide-spread opinion among the masses, that Geology, somehow or other, is in conflict with the Bible. How, they are not

prepared to say, for many of them know but little about either. Even many Christian people who have become acquainted with the general outlines of Geology have also a similar impression. They believe that this branch of science is antagonistic to the Mosaic account of Creation,—that it utterly ignores a Creator. Hence, they regard it with suspicion, and are startled and perplexed with the announcement that geologists have proven that the earth has existed for millions of ages, instead of about 6,000 years: and, that, instead of its having originally come from the hand of the Creator, as we now see it, it has passed through an immensely long and tedious process of slow physical changes, by which it has finally reached its present greatly developed and improved condition.

They also regard with equal suspicion the manner of referring so much of this preparation to the direct agencies of physical and natural forces; such as is involved in the theory of the process of rock-making; the gradual elevation of the continents above the sea-level, and their subsequent developments; the vegetable deposits, accumulation, and consolidation of the various fields of coal; the up-turnings, flexures, fractures, faults, and upliftings of strata, and the bending of the earth's crust, resulting from its cooling and contraction by which many of the great mountain-chains have been reared; the solidification and crystallization of immense mineral deposits through long-continued heat; also the slow changing of sand-beds and mud-beds into crystalline rocks, and filling their fissures with various gems and ores. All this seems to be so much at variance with their pre-conceived notions, and their long-cherished interpretation of the Mosaic account of Creation, that they turn from it in disgust. Others, however, more considerate, are asking if there be anything that is manifestly reliable, that proves the great antiquity of our globe as claimed by geologists? And if so, does not this antiquity necessarily antagonize the book of Genesis?

These two questions are readily answered. In the first place, the geological evidences that the earth has existed for an immensely long period of time are so palpable and so numerous that to a geologist it admits of not a single doubt. But this is not all; not only do such as are capable of surveying the entire geological field find proof of the great age of our globe, but there are such a number of plain surface facts within the reach of all, that will leave no reasonable doubt with anyone upon this point, who will but use his own senses. Look for instance at a section of the Colorado River of Western North America, which runs for 200 miles through a gorge or cañon with vertical walls of rock in many places over 3,000 feet high. As it is evident that the waters of this river have gradually worn away the rocks of sandstone and limestone, and in several places at the bottom for hundreds of feet, it has also worn into the granite formation, is it not also evident that it has taken millions of years for these waters by simple attrition to have worked out such vast results? But more than this; above these lofty walls, a few miles back from the river, the pile of nearly horizontal strata is continued in mountains to a height of over 8,000 feet above the bed of the stream, all of which has been worn down by the slow disintegrating action of the

water. How immensely long must necessarily have been the period in which all this has been accomplished; to say nothing about the untold number of ages that must have preceded the action of the waters of this river, in which these 8,000 feet of rock were slowly deposited; or the vast deposits found in Pennsylvania and Virginia measuring 40,000 feet, or more than seven miles in thickness.

Furthermore, geologists tell us that all this action of the waters of the Colorado in wearing away the rocks to this enormous depth, has been done in what is called Cenozoic time, that is, recent geological time, or, recent time as compared with the long periods which preceded it. This, they tell us, is evident from the fact that this region was still under the sea at the close of the Cretaceous period, as is shown by the Cretaceous strata being the upper formation. For it was not until the close of the Cretaceous period that the Tertiary or Cenozoic period began. Now when it is understood that Mesozoic time, which preceded Cenozoic time, is estimated to have been three times longer than the latter, and that Paleozoic time, which preceded Mesozoic time, was twelve times longer, we can readily see that the earth must have existed from a very remote period. Or, we may put it in another form. If the Cenozoic age lasted 5,000,000 years; then the Mesozoic period would embrace 15,000,000, and the Paleozoic period 60,000,000, making in all 80,000,000 years as the age of our globe, without saying anything at all about the Archæan period which preceded all of these, and which was of itself also very long. Even if this estimate should be thought to be extravagant, still upon any other more moderate, but reasonable hypothesis, the evidences of the earth's great age involving millions of years are absolutely conclusive.

All this, however, does not in the least affect the Mosaic account of Creation; for Moses nowhere names the time of this great event. He simply says: "In the beginning God created the heavens and the earth." His object was not to tell *when* but *how* they came into being. Should geologists ultimately prove that the earth has existed 200,000,000 years, or any other period, it would suit the Mosaic account equally as well.

Nor are we to imagine that geologists are removing the Almighty from the Universe as its Creator, upholder, and governor, by referring the mighty sweep of changes on the earth's surface to Nature's laws, and to her potent physical forces, that have by slow processes outlined and elevated the continents, depressed the beds of the oceans, formed the mighty structures of the stratified rocks, and piled up the cloud-capped mountains. These forces, although they are secondary, are nevertheless all by the appointment of the Creator, and are under His control. They are but the direct expressions of His own will. It has ever been His method in all past ages to work through secondary causes. Even the marvelous processes of growth and development, that are witnessed in the vegetable and animal kingdoms, from primary germs to complex organisms, are all conducted according to and by the laws of Nature; yet who believes that these mysterious forces working out these grand results by natural laws detract any thing from the superintendence of the Supreme Being. So the theory that the preparation of our globe for

the abode of man involved millions of years, in no way disproves that these forces were, ordained and directed by Him. We are to remember that He is never in a hurry. In His plans and works a million ages, or a hundred millions would be of little account. "One day with the Lord is as a thousand years and a thousand years as one day." The long lapse of immensely long geological periods are as nothing in the great calendar of eternity, the last cycle of which is not made up of segments or measured by revolving years.

MEASURED BY REVOLVING YEARS.
HAVERSTRAW, N. Y.

Haverstraw, N. Y.

PERFECT INTERFERENCE OF SOUND BY
TELEPHONE.

[From *Science*.]

Suppose we have two telephones having the poles of their magnets similarly placed, and so

connected with a circuit that a current will traverse their coils in the same direction. It is evident that any electric current passing will cause a simultaneous movement in the same sense in the diaphragms of both telephones. Now, if we conceive the current reversed in one of the telephones, the motion of the currents due to the vibration of the diaphragm of a third telephone in the circuit will produce in the two telephones vibrations *in-do* *post* *phases*; the sounds produced, therefore, will differ by a half-wave length. The same current which in one telephone produces a condensation will in the other produce a rarefaction.

The experiment, as successfully tried in the physical laboratory of Dartmouth college by Professor Emerson and myself, was arranged as follows: the mouths of two similar telephones were placed before the extremities of a Y-shaped tube, and the sound from both telephones conducted to the ear by rubber tubing. A reversing-switch was placed in the circuit, by means of which the direction of the current in one of the telephones could be changed; in this way could be produced at will coincidence or interference of sound. Each branch of the Y-tube was of rubber, so that either arm could be closed by pinching. Organ-pipes of various lengths were sounded near a telephone in a neighboring building. It was found, that, when arranged for interference, the pinching of either of the branch-pipes produced a decided increase in the intensity of the sound; when reversed, an equally decided decrease. The inequality in the intensity of the sounds due to the two telephones was found to be the chief difficulty in producing complete interference; but by partly closing one branch, so as to weaken the stronger sound, the effect was as to the two telephones. In several trials the interference was complete, no sound whatever being audible. The rapid reversal by the switch gave a sharp contrast between the strengthening and the weakening effect.

With singing, the interference was very satisfactory, especially with the low notes; in conversation, however, the sound is not so much weakened, but the quality is perceptibly changed. The vowels seemed to suffer much more than the consonants.

G. S. COOK.

Such pitiable self-stultification as this is simply a narrow, especially when put forth in a text-book by the leading physicists of the world, to be taught as science to the youth of one country. Of course, "we distinguish utterly the *fundamental tone*." Why? Because we take the two fundamental sets of vibrations which, occurring in space, constitute that tone, and by letting them occur in alternation exactly double the number of vibrations.

The foregoing interesting statement appears in *Science* for March 16th last, and is sent to us by a friend for criticism. On the margin of the leaf, in pencil, was written: "Is this conclusive? If not, why not?"

We answer, that it is neither conclusive, nor does it contain one grain of evidence in favor of the so-called law of sound-interference. It is wholly a misapprehension, and it is passing strange that such investigators of physics as Professors Cook and Emswson, of Dartmouth College, cannot exercise the small degree of scientific discrimination necessary to solve this problem. It would take but the perceptive powers of a child, properly directed, to see through the phenomenon and explain it to the comprehension of a class of beginners. We solved this very problem in the discussion of the *double-siren* in the *Evolution of Human Life*, and showed Professors Helmholtz and Tyndall, for the first time they had ever surmised it, why the two disks of the *siren*, when so turned as to pull alternately produced almost silence, and then ended their notorious conflict in a faint octave. Can't some friend of Dartmouth College persuade her professors of physics to read over that explanation of the so-called interference of the *double-siren* beginning at page 286, and thus lead them out of the wilderness on this telephone mystery? They would instantly see that when two cases are precisely similar, and that when the two telephone-diaphragms vibrate together or asynchronously, making their indistinguishable at the same instant in the same direction, they produce a double fundamental tone, and consequently, like the two disks of the *siren* pulling simultaneously, they augment each other's sound. Then by stopping off one of the telephone disks, as in the case of the *siren*, we still hear the fundamental tone from the other but not so loud as with both combined in synchronism. But reverse the action of one of the telephone disks, and thus make them, manifestly, just double the number of vibrations it takes place, which of course produces an octave just as was the case with the *double-siren*. Such octave tone, however, is necessarily imperfect and very much weakened compared with the fundamental tone of both disks, and seems like the "silence" of the so-called interference law to such superficial observers as believers in the wave-theory are blinded as he was by the wave-theory, called it "the absolute extinction of the sounds of both sires," though distinction hearing and admitting the "octave" at the same time! That is, as he immediately explained to his audience of scientific students: "We extinguisn utterly the fundamental tone; but we do not extinguisn its octave"! Lectures on Sound, page 191.

REPLY BY THE EDITOR.

tions in a second, the very thing necessary, as every beginner in acoustics knows, to make the "octave"! If we should take two *barns* to pieces and build a *house* out of the materials, we would "utterly extinguish the *barns*; but we do not extinguish the *house*!" What a brilliant scientist Prof. Tyndall proves to be when taken to pieces and analyzed! In like manner Professors Cook and Emerson, by alternating the vibrations of the two telephone disks and directing them in this condition into a single tube, really and very simply destroy the fundamental tone of both diaphragms, and make out of it a weak octave composed, as Dartmouth professors ought to be able to know, of this very doubled number of vibrations. How shallow, then, is all this talk about one telephone producing a "condensation," while the other produces a "rarefaction"! The same nonsense was largely dealt in by Prof. Tyndall, as the "condensations" of one disk of the double-siren fell into the "rarefactions" of the other disk, and so confused things in his mind that he declared that it produced *absolute extinction*, yet at the same time produced the *octave*!—that he *heard* it and that he *didn't hear* it both at the same time! The professors at Dartmouth College have succeeded in getting the two telephones mixed up in the same way by their rigmarole verbiage of "condensations" and "rarefactions," which have nothing to do, and never had, with sound-propagation.

The same solution we have here given applies also to the phenomena observed in sounding the Chladni plates, about which Professors Tyndall and Mayer make such an ado in their books on Sound. They do not, neither can they produce *silence* with the Chladni plates, as they claim, by combining the sounds of adjacent sectors. They simply produce an obscure octave, as any one can demonstrate; but this, of course, comes near enough to "silence" to be called "absolute extinction" by such superficial observers as we have proved them to be in the discussion of that *double-siren* interference case.

Even the *Conig* instrument for dividing a stream of sound into two branches,—considered the most conclusive proof of this law of sound-interference possible,—is perfectly and beautifully explained in the same way. We elaborately discuss that instrument in the "*Problem*" at page 307, but while showing that it failed to sustain the current view of interference we confess that we overlooked this true and simple explanation here given, the same as that of the double-siren or of the two telephones. The reader will remember that the *Conig* instrument divides a stream of sound into two branches, one branch being half a wave-length longer than the other, and then brings them together into a single outlet where the observer listens for the so-called interference and silence. But instead of *silence* he hears the same confused and weakened octave,—*the longer branch of the pipe detaining its half of the sound exactly half the period of a complete vibration; thus producing alternation in the two parts of the sound at the outlet of the stream, or precisely doubling the number of vibrations over the fundamental, as the octave always requires.* How simply and beautifully does this solution agree with the facts!

The truth is our solution of the double-siren problem is applicable to all these experiments

from which the authorities on Sound pretend to obtain "interference." If they had the courage to read that *double-siren*-exposure in the "*Problem*" they would never publish another such experiment as this of the two interfering (!) telephones. We do not, however, expect them, even after they read it, to acknowledge their error till they are forced to do so by the students of their classes who are fast falling into line against the wave-theory.

But we now come to a solution of a sonorous problem that is still more important in this connection to the science of acoustics, because more difficult to grasp than the one just given, which will show how two fundamental tones are changed, not only into a greatly weakened octave by doubling the number of vibrations, but into another phase still nearer to actual silence. It is this: In changing the vibratory relation of the two disks, as in the double-siren, from perfect synchronism (producing the two unison fundamentals) to perfect alternation (producing the octave by doubling the number of vibrations), a relation between the two disks is reached when it is neither perfect synchronism nor perfect alternation but a phase half way between the two, which makes neither a clear fundamental nor a clear octave tone, but a *muffled smothering of both* nearly if not quite approaching the point of silence. This can only occur, however, between two sounding instruments in close sympathetic proximity, and results from the breaking of their sympathetic attraction for each other in coercing them out of perfect unison. This is the effect that is observed in so-called "beats" when two strings almost in tune reach a point of vibrational relation just enough out of synchronism to strike this sympathetic phase of opposition that tends to muffle the sounds of both.

But what an utterly false pretense in science to call this phenomenon (so easily explained by the process of changing from the fundamental to the octave) the "interference" of the wave-theory, depending as it does upon the law of half-wave lengths, and the "condensations" of one system of "air-waves" falling into the "rarefactions" of another system, neither of which has any existence in fact! The two cases have no resemblance to each other, however much physicists may shut their eyes to the provoking fact. We made this true law of "wave-interference" so plain in the June MICROCOSM, that little children have since seen it and explained it to each other. Let us try in a few brief sentences to make it plain to Dartmouth College.

Suppose two unison instruments of any kind to be of such a pitch as to make their wave-lengths ("measured from condensation to condensation," as the wave-theory teaches,) exactly *ten feet*. Suppose then the two instruments to be sounded ten feet apart. It is manifest that a condensation from one (supposing them to vibrate synchronously) will reach the other just as its condensation is starting, and the same with rarefaction, and thus, according to Tyndall and all writers on acoustics their condensations, by coalescence, will be more condensed and their rarefactions more rarefied. This, as we are taught by the theory, is what makes the sound louder from two unison instruments than from one. But now suppose, while the two are sounding, that they are made to approach within half a wave-

length or five feet of each other. It is clear that the rarefaction from one instrument will then reach the other exactly as its condensation is starting, and thus the rarefactions from either instrument must continually fall into the condensations from the other, and in this way, as every writer on Sound teaches, the two systems of air-waves will neutralize each other *in the line of the two instruments, thus producing quiescence of the air and consequent silence!* This is the real "law of interference" as distinctly laid down and illustrated by Prof. Tyndall in his great book on Sound at pages 259, 260,—precisely as we have here explained it.

Of course it does not require a very skillful experimenter to hit this exact point of *interference* every time the instruments are sounded together, that is, to bring the *exact center* of the rarefaction of one instrument into the *exact center* of the condensation of the other. Suppose that the two instruments, on starting to sound, should not vibrate in *exact synchronism*, which is more than probable; it is plain that the distance apart for coincidence would not be exactly ten feet, nor for interference exactly five feet, but a distance corresponding to such variation from exact synchronism. But if the two instruments while thus sounding should be slowly moved from and toward each other for a distance of ten to fifteen feet, it is plain that the exact point of "interference" and "total silence" must be touched at each trial. Of course in such cases, persons listening in the line of the two instruments would instantly cease to hear the sound on reaching this interfering point provided there is any truth in the wave-theory. No man pretending to scientific knowledge is so dull of apprehension as not to see this.

Now we are prepared for the question:—Dare any Dartmouth professor, over his own signature, say that with such sounding of two unison instruments, precisely as the interference law requires, one particle of increase or decrease takes place in the intensity of the sound, heard in any direction, and with the two instruments sounding in any possible relation to each other? We answer emphatically that no professor, having any self-respect, dares to so state. For two years we have been offering them the columns of THE MICROCOSM, to say, if they have the courage to do it, that this law is anything but a preposterous fraud upon the intelligence of mankind. But not a syllable can we coax from them, though they know they can reach more than fifty thousand intelligent readers by a few strokes of their pens. We know, as we have cheerfully acknowledged, that two equal systems of *true* waves as, for example, on the surface of water, will destroy or neutralize each other by interference; that is, by the *crests* of one system falling into the *sinuses* or *troughs* of the other system. Yet Helmholtz tells us, as we have often quoted, that "the process in the air is *essentially identical* with that on the surface of water,"—"precisely similar,"—"exactly in the same way," &c. *Sensations of Tone*, page 14.

Why then do not some of these great professors who teach this law of interference to their classes, and who go to the trouble of elaborate and expensive experiments with double-sirens, Chladni-plates, and "interfering" telephones, proceed to immortalize themselves and at the same time wipe out the author of these per-

sistent and provoking charges of scientific cowardice, by accepting this generous offer? Is any man so verdant in this land of the free and home of the *brave* as to suppose that they would not gladly embrace the golden opportunity of meeting the editor and putting a quietus upon his "pernicious book," if they felt safe on this "interference" question? No; we cannot but feel that they regard it as much healthier for their future scientific reputations to keep up the game of so-called "silent contempt," though we observe that such high-toned professional dignity does not prevent some of their number from coming out occasionally with virulent reviews even in first-class quarterlies, especially when they feel sure that the *nemesis* of the author's reply will not be permitted to follow them. But they are beginning to wake up to a realizing sense that they cannot hide from THE MICROCOSM, even though they may call for the Colleges and Universities to fall on them.

Again we notify them that the columns of this magazine are open to any professor of physics in a first-class college who is willing to undertake the defense of this law of sound-interference as taught in the text-books. A number of students have written us that this "respectability" dodge has "played out." College Students everywhere are laughing in their class-rooms as their teachers' backs are turned, at this "silent-contempt" subterfuge, and are beginning to call upon the professors of sound-wave diagrams to rise and explain. They are becoming decidedly dissatisfied at being taught any longer a theory whose fundamental law of wave-interference two little children with unison penny whistles can explode. Is not this, then, a favorable time to settle the matter by a practical demonstration? We pause for a reply.

ALLOPATHY AND HOMEOPATHY.

BY DR. P. H. CRONIN.

EDITOR MICROCOSM:

In your last issue Dr. Bowie speaks of Hahneman, as being "the discoverer of the only true law of therapeutics." Now regarding as I do *The Microcosm* as a journal in which scientific facts are always opposed to unscientific theories, I waive any professional feeling in regard to the doctor's assertion, while submitting his theory to the crucial test of honest enquiry.

Opposing facts to a mere *ipse dixit*, it is well known to scholars that Hahneman, though making it the corner stone of his system, did not discover the law of *similia*. Hippocrates, 2,000 years before him, advised and practiced the use of contraries and similars and "proved" their results upon the living body. Heller also "proved" the action of various remedies and is credited by Hahneman with this half of the "law." But, singular to relate, the "Messiah of Medicine" is strangely silent as to Paracelsus, who, two centuries before his time, announced to the world the doctrine of similars, using the legend so popular at this late date, "*similia similibus curantur*" (Ed. Geneva 1658.) The same "Monarch of medicine" in his "Fragmenta Medicina" (page 168 et seq.) heads a lengthy paragraph with these words "*simile*,

similis cura; non contrarium," and then goes on to prove this by the varied actions of Mercury; Sulphur and Salt.

So much for the discovery of the "law;" now as to its permanency. Before his death the system had lost hold upon Hahneman's own disciples, in spite of the fact that he pronounced his "law" unchangeable, while anathematizing what he called "the practitioners of the new mongrel system, a mixture of homœopathic and allopathic processes." Thirty-five years later, Dr. Wyld, Vice-Prest. Brit. Hom. Soc., wrote to Dr. W. B. Richardson (*Lancet*, June 1877) as follows: "First.—That the views of Hahneman are often extreme and incorrect. Second.—That Hippocrates was right, when he said some diseases can be treated by similars and some by contraries, therefore it is *unwise and incorrect to assume the title of Homœopathist*. Third.—Although many believe that the action of the infinitesimal in Nature can be demonstrated, its use in medicine is practically, by a large number in this country, all but abandoned."

Now, while in Dr. Bowie's neighbourhood some may believe *nolens volens*, in pure and simple homœopathy it is a fact—evidenced by the attendance of leading teachers of the system at Rush and other colleges in this city—that the majority of so-called homœopaths are anxious to perfect themselves in scientific, not theoretic medicine and surgery. We know that the "great master" ignored all of these, while theorizing to such an extent as to leave no record of his cases. Indeed Dr. Bowie cannot deny that in America, as well as in England, the "mixed" system—so much abhorred by Hahneman—is the general practice of the majority of his followers. That the "law" itself is not free from error, is evidenced by the fact that the itch—whose "spiritual" manifestation was according to Hahneman the primal cause of mania, gout, cancer, and kindred troubles—is due to a very material parasite which a few hours treatment with sulphur "potentially" sends to its last home. We now know that lead-palsy, consumption and the sporadic diseases are due to microscopically demonstrable materiality. Leading homœopaths rejoice in this evident profession of medical science, against which no law, but that of the Creator can stand as an eternal fixture.

As to the "stealing" attributed to Dr. Smith, of Bellevue, the statement may serve the purpose of abuse, but not of argument; for in "this late day" it is as well understood—as it was in the time of Hippocrates—that the *physician* may use any remedy—no matter whence its source—that in his judgment will benefit his patient. He gives as freely as he takes, for no remedy is a secret in the profession of medicine. Nature, from whose laboratory comes relief for the ills with which she so often afflicts us, has at last come to be regarded as a physician of good repute and worthy of consultation in all cases. To her will, as reflecting that of "Him who was, is, and is to be," does the conscientious "Doctor of Medicine" bow, leaving to time the "proving" of much vaunted, though often defective "laws."

Yours, Respectfully,
P. H. CRONIN, PH. B., A.M., M.D.
Late Prof. St. Louis Coll. Phys.,
and Surgeons. Lecturer, Lindenwood College, etc.

CREATION AND FOREKNOWLEDGE.

BY REV. L. W. BATES, D. D.

DR. HALL.—*Dear Sir:* Whilst I read with interest the communications of Mr. Williston on the foreknowledge of God, it was not with entire satisfaction.

I think he fails to show how the risk of a venture in creating the fallen angels and Adam without foreseeing that they would deprave their natures and become sinners, would be greater than the risk in creating them with the full knowledge that they would not keep their first estate. Nor does he make it clear why Deity should allow Cain, Judas, Voltaire and Paine to come into being with the full knowledge of the result of their lives, and not allow them to come into being without foreseeing the result of their lives. Wherein is the advantage of the certainty of failure over the uncertainty of failure?

Is the prediction of an event that Deity intends to bring to pass any more evidence of foreknowledge than the announcement of the flood, the freedom of Israel, and the destruction of Jerusalem?

Without taking issue with Mr. Williston's position in regard to God's foreknowledge, it occurs to me that to sustain it, he needs to cite the prophecy of an event that would furnish no premonition at the time of the delivery of the prophecy, and in the fulfillment of which God exercised no agency whatever.

CENTREVILLE, MD.

A STRANGE PROBLEM.

WILFORD HALL: *Dear Sir*—As scientific men differ in their theories of the mysterious things of earth, will you please (through your *MICROCOSM*), give your views concerning this? An artesian well is sunk to the depth of 98 feet, within about a hundred yards of a river, about one-half mile wide and 15 feet deep. It is self-flowing all the time; but when the tide is up it flows nearly as strong again as when down. The bay is about 40 miles distant. The country is quite level for many miles around. Please explain the cause of self-flow, and its increase at full tide.

Yours truly, T. H. HARDING.
QUANTICO, MD.

REPLY TO THE FOREGOING.

There is, as it seems to us, but one feasible answer to these questions of the Rev. Dr. Harding. The continuous flow of the well is evidently caused by the supply of water coming from a subterranean reservoir *under pressure*. It is also manifest that this reservoir, or at least a portion of it, must be beneath the river bottom, but so near to it that the weight of the river affects the pressure which causes the flow. Hence, when ever the rise of the river caused by the tide takes place, this additional weight of water is added to the pressure, by which the rate of flow is correspondingly augmented. We trust this solution will be satisfactory to our correspondent.

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WILFORD'S MICROCOSM.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourself responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent*.

EDITOR,

SUBSTANTIALISM.

No revolutionary ideas are of sudden genesis. Important discoveries are generally of progressive development, and are mostly the results of the necessities of the times, or of the world's preparation for their reception, rather than of any extraordinary genius on the part of those by whose immediate agencies they are brought prominently into notice.

Religious *substantialism* is as old as Christianity. Neither Christ nor the Apostles contemplated a future life as any thing less than a real, personal existence,—as substantial or entitative as the present, but purified from its gross and material carnality. They entertained and taught no crude or mystified ideas concerning the soul's personal identity after leaving this earthly state; nor had they any conception of a future spiritual home that did not involve all the beauty, reality, and perfection of the most exquisite and desirable dwelling place on earth. That very day the confiding malefactor was to be with Christ in paradise,—not an indefinable, formless, impersonal non-entity called *soul* as some view it, but the *man* himself, personated by "*thou*." When the Saviour promised His disciples to go and prepare a "*place*" for them, it was a real *place*,—not a mere *state* or *condition*, as some would have it, with neither locality, boundary, nor entitative reality. To assure them of its substantial nature, and character, and especially of its extended accommodations for all his people, He declares that this heavenly home is to be composed of innumerable residences, within a great residence,—countless homes within a great home. "*In my Father's House are many mansions.*" This "*House*" is the same "*building* of God,—an *house* not made with hands, eternal in the heavens," of which the apostle speaks as the dwelling place of those whose "*earthly house* of this tabernacle" was soon to be "*dissolved*." Not only was this "*building* of God" a real residence in the apostle's estimation, but the souls which were to make it their final abode were nothing less than real *men*—the *inner men*—who had put off or left the *outer men*, or their earthly houses, for that new dwelling which had "*foundations*," in the plural, as its "*many mansions*" naturally required.

So have all the great advocates of Christianity, from the times of the apostles down, given glimpses in their writings of this substantial view of a future state, while some of them have written whole treatises to prove that our souls will be as truly and literally personal and substantial in the next life as they are in this.

We have an old work now by us from the

pen of Martin Luther, affirming and insisting upon this spiritual philosophy of substantialism as positively and unmistakably as does any contributor for *THE MICROCOSM*; so that it is not a peculiarity of Swedenborg's writings, as some of the New-Church people seem to think, to present prominently this spiritual philosophy of the soul's real, bodily shape and functions as soon as it leaves the earthly house of its tabernacle. This philosophy of religious substantialism is therefore no one's specialty, and no one can claim for it a patent. It came originally from the fountain of divine truth, is clearly taught in the New Testament, and has been taught with more or less emphasis, and distinctness in every century of the Christian era; while in the theological works of the past century, amidst all the mysticism of scholastic divinity, and the clashing of creeds and religious formulas, now and then a book or a published sermon from some independent and thoughtful clergyman has appeared and given the same prominent importance to this philosophy of religious substantialism as did the great reformer Luther.

But *Substantialism* from purely a religious or spiritual standpoint was not alone sufficient to meet this skeptical world's growing necessities. The rapidly expanding intellectuality of our age of startling inventions and revolutionary discoveries, had in a peculiar manner directed the more advanced minds to the book of Nature which had already revealed from its opening pages so many valuable truths to the searching eyes of persistent investigators, that there was a restless looking for new light in that direction. New truths have been constantly developing from that source,—even truths not taught nor intended to be taught in the Bible. These discoveries were leading thousands to ask whether science, in all its vast researches, might not yet discover some proofs that will tend to confirm the reality of the religious philosophy and thus give new assurances from Nature's volume to strengthen our religious hopes of a personal and substantial existence hereafter? It was at this juncture that our mind was directed to the subject. We saw that materialism had already secured a strong hold upon the central principles of modern religious philosophy, even in the minds of most if not all of the educated clergy of this country and Europe. We needed only to glance at the scientific theories taught in our great colleges and universities to see that no clergyman who had thoroughly imbibed those doctrines was capable of standing one minute before such atheists and materialists as Huxley, Haeckel, and their intelligent disciples. The very principles of physical science

taught in our text-books and lying at the foundation of a full college course were made up of the grossest materialism, which in their very spirit and letter repudiated the substantial nature of the soul, life, mind, or anything about man save his material body. How could a mere mode of motion of the material particles of the brain and nerves be the rational subject of personal immortality? That this was what the soul, life, mind, and spirit consisted of, and only this, the greatest living scientists affirmed from the very scientific analogies that sound, light, heat, electricity, gravitation, and magnetism were only modes of molecular vibration which necessarily ceased to exist when the molecules involved in such motion came to rest. No learned or college-bred clergyman in the world could avoid being forced to the same views should he ever allow himself frankly to face the logical consequences of his scientific training. If light and heat, for example, were only modes of motion and not real entities, why should any rational or logical man view the manifestations called life, mind and spirit as more likely to be entitative? That light and heat were only such modes of motion was an irresistible conclusion with such profound scientists as Young, Huygens, and Newton, since Sound was but a mode of motion by universal consent,—not a thought of anything else having entered the mind of a physicist since the time of Pythagoras, more than 2,000 years ago. Of course then Huygens was logically right in seeking to invent an all-pervading *ether* by which to get some material substance to vibrate so that light could take its proper place among modes of motion and thus occupy a consistent position with sound. And of course Newton was only logical in finally yielding his corpuscular or emission theory of light, since it never entered his great intellect to make sound come to the standard of substantial light, and thus make both of them corpuscular emanations. Of course, then, after this unconditional surrender, heat must of necessity take the same course, and so also must follow magnetism, electricity, gravitation, &c. And finally the materialist, who denied the existence of a God, took his cue from these distinguished scientists and discovered that the soul, too, was nothing more than the physical motion of the brain and nerve molecules, and was thus fully and scientifically confirmed in his materialistic position. Having such irresistible conclusions and deductions before him, drawn by the greatest scientific minds of the world, who can blame Haeckel for his logical materialism? He was only carrying out physical science consistently. Besides, why should not the materialist take

courage in this logical view since every clergyman in the land, pretending to a scientific education, was in necessary accord with the views of Newton and Huygens? It was impossible to let one of the natural forces stand admitted and unchallenged as a mode of motion, as in the case of *sound*, and not in the natural course of logic resolve all the other forces into corresponding and analogous modes of motion.

Thus we see how Materialism had legitimately taken possession of the field and entrenched itself behind the breast-works of so-called scientific discovery and progress. Clergymen were helpless, with all their religious substantialism. They dared not to approach these ramparts to attack the doctrine of the soul or spirit as but the motion of brain-molecules, with nothing substantial about it, lest they should impale themselves upon the sharpened branches of the abatis of their own conceded modes of motion throughout the whole realm of the natural forces. The entrenched materialists, chuckling in glee over the heaps of scientific ammunition furnished them by religious colleges, would reply with chain-shot to any attack from the clergy, and say, stand back, gentlemen; you agree with us and with all modern science that the rest of the forces of nature which cause physical manifestations are but modes of molecular vibration! We have but honestly and logically carried this universal doctrine of science to its legitimate boundary by making the life-force, the mental-force, and the spirit-force, which move our bodies, correspond in nature and action as modes of molecular vibration, and which of course must cease to exist as soon as the brain-molecules cease to move just as Sound has no longer an existence (not being substantial) as soon as the air-molecules, whose motion constituted it, come to rest!

In the very nature of things the clergy must be powerless, even panoplied as they are with their armory of religious substantialism, when met by such logic. Of what use is a revealed substantialism as the basis of a future immortality which the ministers themselves virtually have stultified by ignoring all corresponding and analogous substantialism in the realms of Nature? They scientifically tear down with one hand faster than they can theologically build up with the other. Their whole labor in the cause of religion is practically self-nugatory, especially with men of thoughtful, scientific minds, by their unsuspecting but fatal concessions to the prevailing science of the schools.

We have thus briefly pictured the condition of things in the religious and scientific

world as it presented itself to our mind when we first took our pen in hand to write the *Problem of Human Life*. We saw that religious substantialism, true and grand as it is, was totally unavailing to satisfy the intellectual necessities of any logical mind that had been educated in the science of the present age, unless it was supplemented by a well-grounded scientific and philosophical substantialism that would embrace the whole realm of Nature. If such a substantialism could be rationally and scientifically established and maintained in the face of the great materialistic philosophers of our day, then we plainly saw an open field and a fair contest for the final supremacy of God's revealed truth in harmony with the unmistakable declarations of the same God as recorded in the book of Nature. With scientific substantialism thus established and fully vindicated we saw the shackles fall from the limbs of tens of thousands of God's ministers, who had been unconsciously manacled when young in the Colleges and Universities of our land. With these manacles thus broken and removed we foresaw the result of the contest that would then inevitably follow, and that is—materialism demoralized and driven in disorder behind its entrenchments, with its base of supplies in the colleges and pulpits cut off, and its discomfited garrison there confined to starve or else to surrender.

After thus surveying the field and determining upon the new departure, we by no means failed to see that we had taken an immense contract upon our hands. We felt sure, however, of our cardinal position, namely, that a philosophical substantialism was the only Key to unlock the problem of life and to open the door scientifically to an immortal state of being. But to break through the ranks of scholasticism by battling successfully with the so-called modes of motion of physical science, was where the real struggle was to occur; and to face the storm that we knew must result, and to stand in the breach alone, as we knew we must do at least at the start was enough to make a timid man's heart quail within him. Because, to be successful at all no other course was possible than to begin at the very foundation of this *motion* problem.

Hence, of necessity, we began at *sound* as the conceded, and universally accepted vibratory motion of the air, and as the sole foundation upon which light and heat as modes of motion, by common consent, had been built. As sound was the crucible in which all the forces of Nature had been scientifically resolved into molecular vibration or wave-motion, and in which materialism had finally and log-

ically overthrown the entitative existence of the soul, and thereby the possibility of an intelligent, personal God or of a future life, we necessarily resolved that *sound* first and foremost, as a mode of motion, must be overturned and shattered or a broad scientific substantialism could never be established. With the wave-theory, however, overturned, it was but an easy matter to resolve sound into an incorporeal or immaterial substance to act by corpuscular contact upon the auditory membrane and nerve, analogous to the admitted action of substantial odorous corpuscles upon the nasal membrane and the olfactory nerve, without the assistance of air-waves or any bending in and out of such sensitive membranes whatever.

A single glance at the field of Nature, after this initial resolve, brought to view numerous analogies to support and confirm such substantial view of sound, as fully shown at the close of the fifth chapter of the "*problem*," provided of course, first and always, as an underlying condition, that the current theory of acoustics should fairly and scientifically break down.

Hence, as we stated last month in an editorial entitled—*Value of the Sound Discussion*,—we were compelled necessarily to lay the foundation stone of our substantial superstructure upon the ruins of the current theory of sound. That the theory has been logically and philosophically reduced to ruins, is fast becoming apparent to all unprejudiced minds capable of reasoning scientifically. A candid thinker has only to study the several articles on different phases of the sound-question in this single number, especially the reply to Prof. Carhart, and also our answer to the case of "Perfect Interference," to give up the whole theory as intrinsically fallacious. If it is false, then substantialism is an established philosophy beyond all peradventure or doubt, because the other modes of motion in Nature, built as they are upon the undulatory theory of sound, must also fall into the same heap of ruins.

In conclusion, we have reached the important question for which we started out to write this article: Will ministers of the gospel generally, as thousands of them have already done, see the value of what has thus been accomplished for the cause they have at heart by this new departure in science, and will they join with us and with their brethren, who are already advocates of the substantial philosophy, in prosecuting the work of crushing out materialism so happily and successfully inaugurated? Or will they, because of its novelty and because it happens to be in conflict with the so-called science of the day which they have been taught as truth, look on with indifference and

thus indirectly aid and abet Haeckel and Huxley in their death-struggle to prove the soul but a mode of molecular motion, and thus dissipate our last hope of immortality?

That the soul or spirit is nothing but such a mode of motion of the material molecules of the brain, just as Prof. Haeckel teaches, without the slightest substantial foundation for an existence hereafter separate from the corporeal organism, we firmly believe, unless the wave-theory is proved to be false, and unless sound, as well as the other natural forces, is scientifically reduceable to a substantial basis. We have thus staked our all upon the issue; and upon the truth of this new philosophy of scientific *Substantialism* we have resolved to survive or perish.

REPLY TO PROF. H. S. CARHART ON SOUND.

(In *The North Western Christian Advocate*.)

Duty to our subscribers and to the cause of true science, for which we claim to labor, compels us to devote more of our valuable space to these pretentious reviews of our Sound-departure than otherwise we would like to do.

Last month we gave a brief notice of an abusive attack by Prof. Carhart of the North Western University, at Evanston, Ill., and promised to answer him fully in this number of *THE MICROCOSM*, and here the reader will find it.

The spirit of the attack is one of the bitterest that has fallen under our notice. It is also one of the most harmless in point of argument, while boastfully pretending to answer and destroy our positions right and left. We cannot deal in detail with every statement of the dozen which he makes with the apparent authority of an oracle; but we will attend to the most forcible and plausible of his criticisms that the reader may easily apprehend what might be done with the rest. First let us note the spirit of his attack:—

"Further notice is hereby taken of it [the "*Problem*"] *not because of any merit it possesses, but rather by reason of its pernicious influence.*"

"The present article will be confined entirely to the *part on sound, which is the only portion I have read.*" [An excellent and intelligent judge of the book's merits, and its "*pernicious influence*"!]

"It is much to be deplored that so *worthless* a book has received the indorsement of certain college professors and clergymen who belong to the class of '*unbiased scientists*,' so often patronizingly appealed to, *but who make no pretensions to scientific knowledge or attainments.*" [Funny "*college professors*" and "*scientists*" that "*make no pretensions to scientific knowledge*"!]

"The *explanation* of this indorsement lies in the avowed purpose with which the book was written of *demolishing evolution.* [How does he know, since he has not read that part of it?] Approving the object, it has been *unfortunately easy* for these gentlemen to *accept the reasoning and conclusions without taking the trouble*

to inquire into the premises"! [Yet this self-stultifier confesses that he knows nothing about either the "premises" or "conclusions" having read only "the part on sound"! A fine judge, he, of *premises* and *conclusions* without reading them while ridiculing thousands of his superiors in education (as will soon appear) who have both studied them carefully and pronounced them unanswerable!]

"It has never been my misfortune to read another book of such *amazing assumption* and *brazen assertion without any basis of support*." [It has never been our "misfortune" to read a pretended review of a book by such a "brazen" bigot, who boastingly condemns the main department of the work while stupidly confessing that he had not read it, and who can insolently sneer at thousands of learned clergymen who have read the entire work and have pronounced it a godsend to this age of infidel science!]

So much for the spirit of our assailant, with vastly more that might be quoted in the same vein; and so much by way of a little wholesome rebuke. The reader will see with astonishment, as he follows this reply, where rests the "amazing assumption" "without any basis of support." Let us now come directly to his criticisms on our sound arguments.

His first "brazen assertion" is that we make no distinction between an atmospheric undulation and a current or jet of air; yet we make this very distinction in more than a score of places in our book. As the Professor is entirely at sea on this elementary question of physics, namely, atmospheric disturbances, water-waves, &c., let us devote a little time to putting him right. We deny, of course, that anything like true wave-motion (such as that on the surface of water or on a grain-field) can take place in the *interior* of the aerial ocean by the slow motion of a disturbing body, any more than such waves or "condensed pulses," as they are called, can occur in the midst of the Atlantic Ocean a mile below the surface. We call them waves by accommodation, but such motion in water would merely produce convolutions for a short distance around any disturbing body, such as a fish. The same is true of the air, only to a greater extent, owing to the more yielding elasticity and mobility of the aerial ocean, as by the motion of a fan or a tuning-fork's prong. A very swift movement of a body will utilize this elasticity and condense the air in front of it and thus send the condensation to a limited distance, as seen in the rapid movement of the vocal organs in sending such air-vibrations against a phonograph diaphragm, causing it to produce similar to-and-fro vibrations. But these so-called air-waves are not sound-pulses at all. They are merely the incidental effects of the motions of the sonorous body which produce the sound, as so repeatedly shown in THE MICROCOSM and in the "Problem." As well talk about the incidental tremor of the conducting wire near a dynamo machine as the veritable electric current, or as condensed electric pulses! These incidental air-waves, observed near a sounding instrument, are no more a part of the sound-pulses that pass off at the same time, than is the destructive condensed air-wave that is driven off from a magazine explosion by the addition of a large body of gas, a part of the sound-pulse heard at the same time. Yet all the

authorities on sound really make this air-wave that destroys buildings identical with the sound of the explosion! It is therefore not surprising that small copyists like Prof. Carhart should fall into similar errors. But while all scientists with one accord insist that the measurable atmospheric vibrations sent off from a powerfully sounding instrument, and which visibly communicate similar bodily movements to the diaphragm of a phonograph, are veritable sound-pulses, yet with the same accord they repudiate all such sensible and bodily displacement whenever driven to the wall and forced to face their "sound-waves" of "condensation and rarefaction" in *iron*. Presto, change! They are then only too anxious to hide the wretchedly absurd theory under so-called "molecular vibration," with hypothetic molecules 50,000 times too small to be seen under a microscope, and with their motions "to and fro" still smaller than the molecules! (See reply to Prof. Strong in the June MICROCOSM.) They thus easily obtain the desired "molecular motion" to suit this forced change of base, since according to the still more absurd "molecular theory" the molecules of all bodies are in a constant state of motion "to and fro" and in mutual bombardment of each other. How splendidly the "modes of motion" dovetail into each other; and how conveniently they help each other out of scrapes!

Again; we have repeatedly shown that the exceedingly slow motion of a tuning-fork's prong when sounding can by no conceivability compress the air so as to drive away a condensed pulse at the velocity of sound. Even Prof. Tyndall's intuition made him aware of this, since he supposed that in order to produce a compression of the air, or a so-called "sound-wave," the prong must advance "*swiftly*;" and Helmholtz adds his strength to the same view by calling the motion of a *pendulum*, 60 or more inches in a second, "*very much slower*!" How egregiously those great physicists and their very much smaller disciples are deceived! We showed in the July and May MICROCOSMS that the fork actually sounds audibly when its prongs are moving less than at the rate of *one inch in a second* at the swiftest part of their travel. What superlative nonsense to teach for science, as do Prof. Carhart and all professors of physics, that such a prong "*swiftly*" advances, or that a pendulum at full swing goes "*very much slower*!" And what stuff to inculcate as natural philosophy in a great university that a prong of a tuning-fork, demonstrably traveling at this snail-like pace, "*carves*" the air into "condensations and rarefactions," and sends them off at a velocity of 1,120 feet in a second! Yet that is exactly what we are compelled to believe if we admit the wave-theory to be true.

We now repeat our statement, to which Prof. Carhart so severely objects, that such a slowly-moving body passing through the air, instead of condensing it, will send off no kind of disturbance swifter than its own motion, *since it moves too slowly to utilize or bring into play the air's elasticity*. (See reply to Prof. Comstock, last month, in which this *elasticity* problem is fully discussed.) Prof. Carhart denies this, and refers to the waves observed to pass over the surface of a field of grain, as an illustration. Such wave-motion, however, is directly against him. No one can suppose

that such waves can move a particle faster than the wind that produces them! Thus he stultifies himself at each criticism he attempts. The reason why such waves on a grain-field can move no faster than the motion of the disturbing body is that this disturbing force (the wind) is the sole cause of the movement, as the prong's motion is the sole cause of the air-disturbance it sends off,—that is, when the prong moves with a velocity not sufficient to bring the elasticity of the air into play. The wave-theory, however, is here proved to teach the anomalous doctrine that when the prong moves only at the rate of *one inch* in a second it sends off condensations of the air 1,120 feet in the same time; and then if it should move at the velocity of 2,000 feet in a second, it would not send a wave a particle faster, but exactly at the same rate, namely, 1,120 feet in a second, or slower than the prong! And as the culmination of scientific absurdity we are forced to the conclusion that if the prong should travel only at the rate of *one inch in a year*, it would still condense the air *because it displaces its particles*, driving off its “waves” at the same velocity of 1,120 feet in a second! *Reductio ad absurdum!* We thus get a glimpse at only one of the many weak points in this theory of so-called air-waves as the cause of sound.

Not so, however, with *water-waves*, the real wave-motion which the Professor uses as another illustration of the action of air-waves, or “sound-waves,” as he falsely calls them. He evidently has not yet caught the first glimpse of the true cause of wave-motion on the surface of water, but actually supposes that such waves move by the same law as the air-disturbances which are really *sent off* by the force of the disturbing body. Why, this professor does not yet know that *water-waves are not sent off at all* by the disturbance which originates them, and that their velocity is from an entirely different cause. The reason why he has not learned this first law of wave-travel is because it is nowhere to be found in the text-books, and the true cause of such motion on water (we merely state it as a historical fact—not boastfully) was never published, so far as we can find out, till it appeared in this journal. We have challenged scientists to point even to a hint of the true solution of this problem elsewhere. Let us again briefly explain the mystery for the enlightenment of our needy critic.

At the commencement of a system of waves the water is simply displaced by the falling pebble or the end of a rod or whatever causes the disturbance, when a ring of water is raised around the place where it strikes; and this is everything the displacing body does in the premises. Then gravity, an ever-present mechanical force, steps in and pulls down this ring of water, thereby pressing up another ring outside of it but not quite so high; then it pulls that down, pressing up another, and so on as far as the waves extend. Their velocity, therefore, depends entirely upon this uniform vertical pull of gravity, and as a high projection of water must fall with *accelerated velocity* in proportion to height, according to the law of falling bodies, it presses up the next ridge with corresponding velocity. Hence the velocity of propagation of any system of waves under this uniform action of gravity must be in exact proportion to the size of the waves thus propagated. How strange that we have

to repeat and insist upon this true philosophy of wave-travel before we can get professors of physics to comprehend it! And how superficial the idea that water-waves, *not sent off at all*, but which are thus propagated by the vertical and constant action of gravity, can *reflect*, when striking a wall, at the angle of incidence! No one but a child in knowledge could confound the limited reaction of this vertical gravity-effect upon water with the forward projection and reflection of such substantial emissions as sound and light must be, as shown by the reflective bound of an india rubber ball. But this beautiful philosophy of wave-motion, so entirely new to science, and the difference between water-waves under the sole action of gravity and air-disturbances where no gravity can come into play, will undoubtedly prove a surprise to Professor Carhart, since it overturns every illustration he has employed in his four columns of criticism. This will appear more fully after a little. But our North Western philosopher must not be discouraged. If he will divest his mind from text-books and apply himself with careful thought to independent study, he will no doubt find that he is not even yet too old to shake loose from such an irrational theory of sound as he is now teaching.

Another criticism which the professor presents with the greatest apparent confidence, and with the same lack of scientific discrimination, is aimed at our “locust-argument” in which we urge that the insect, by its physical strength alone, if the wave-theory be true, must shake four cubic miles of air and condense it with a mechanical force equal to the displacement of 2,000,000,000 tons of solid matter. The reason for this conclusion is plain to the commonest apprehension. The stridulation of the species of locust here referred to can be distinctly heard throughout an area equal to four cubic miles of air. This is well known. The wave-theory teaches that sound only travels by the mechanical shaking of the air,—throwing it into “condensations and rarefactions,”—and that every part of the air thus permeated with sound is disturbed with a force sufficient to shake a *tymppanic membrane*, since an ear any where present can hear the sound which can only occur by the bending of this membrane “in and out” according to all authorities on acoustics. That this is the teaching of the current theory needs no proof here. Every student of science is familiar with the fact. We therefore regard this locust-argument as simply invulnerable, and as among the many rocks upon which the wave-theory is destined finally to split; and we here announce that we will cheerfully risk the whole controversy, as to the truth or falsity of the theory, upon this single problem. We challenge any first class professor to a land-to-hand contest in THE MICROCOSM over this single question, with the understanding that the wave-theory stands or falls thereby according to whichever of us shall suffer defeat. But now to Prof. Carhart, and we ask the reader to mark well what we are about to say.

The professor does not pretend to deny that this entire mass of air is thrown into “condensations and rarefactions” 440 times a second (the pitch of the tone being that of A.); that it is heated and cooled that number of times in a second, and that this heating and cooling by the insect's sound is sufficient to add 174 feet

in a second to its velocity. No; Prof. Carhart, with all his hardihood, does not and dare not deny this as the literal teaching of Tyndall, Laplace, and every advocate of the wave-theory. He may talk around and about this heating and cooling of the air, and try to explain it, or rather mystify it, as he does through nearly an entire column of the *Advocate*, and still not a grain of sense or reason can be put into it, and he certainly knows it. Neither does he deny that every cubic *quarter-inch* of the mass of air permeated is shaken and compressed by this sound with a mechanical force powerful enough to bend a tympanic membrane weighing half a grain "in and out" 440 times a second if such a membrane were present; and consequently, as there are enough of these cubic quarter-inches of air so shaken to contain 2,000,000,000 tons of such membranes with an abundance of room for them to vibrate, as he can soon figure, it follows that the *sound* of the locust actually exerts a mechanical force upon the air permeated by it sufficient to displace that enormous mass of solid matter 440 times a second and keep up this mechanical exertion a full minute at a time! Does Prof. Carhart deny that the *sound* of the locust produces this effect? No. Dare he deny it? Not a bit of it. We invite him to do it, for that instant he gives up the whole wave-theory which teaches that *we can only hear sound by the bending in and out of this solid membrane of the ear, weighing half a grain!*

Lest he might try to evade the force of this annihilating argument, here is a clincher in a very short paragraph from Professor Tyndall. After striking the end of the row of glass balls and showing how the motion is communicated through the row from one to another, thus driving the farthest ball away, he remarks:

"Thus is sound conveyed from particle to particle through the air. The particles which fill the cavity of the ear are finally *driven against the tympanic membrane which is stretched across the passage leading to the brain. This membrane which closes the drum of the ear is thrown into vibration.*" . . . "Thus also we send sound through the air and *shake the drum of the distant ear.*" *Lectures on Sound, pages 4 and 5.*

Now as Prof. Carhart does not and dare not deny this as the teaching of the wave-theory (since he teaches it himself to his classes in the university as we have positive proof), what does he say to get out of the monstrous absurdity of a trifling insect exerting the absolutely necessary mechanical force to meet our estimate? First he admits all we claim, that it is an infinite impossibility to attribute this shaking and condensing to the strength of the locust. Here are his words:

"Does any sensible man suppose that a reputable physicist could ever adopt a theory which would involve such *infinitely impossible consequences?*"

No one supposes that any reputable physicists would *knowingly* "adopt" such a theory. Neither would a "reputable physicist" *knowingly* teach that a "sound-pulse" passing through a tin tube would blow out a candle without a "puff of air!" The truth is, the "reputable physicists" have all taught the wave-theory without knowing or even suspecting these "infinitely impossible consequences" till the attention of the scientific world was first called to them in the *Problem of Human*

Life! That explains why all reputable physicists have been teaching for centuries a theory involving such nonsense as here pointed out.

Then we repeat the question: What does Prof. Carhart say to this conceded mechanical effect exerted by the air, equal to the rapid and continuous displacement of 2,000,000,000 tons of solid tympanic matter, since it is "infinitely impossible" for the locust to do it? Why, he tells us just as Prof. Humphreys of Vanderbilt University told us; just as Professor French of Urbana University told us that the locust has nothing at all to do with this mechanical exertion but to start the first air-wave directly at its little legs, and that this mass of four cubic miles of air moves itself by its own "*elasticity*"! No mistake about this. Here are his words which he will try in vain to wash out for the rest of his natural life:

"In a similar way the locust disturbs the equilibrium of the air *immediately about it*, and the disturbance subsequently travels from particle to particle *through the agency of the elasticity of the air*"!

Thus we have him helplessly pilloried as the scientific laughing-stock of the world. The North Western University is made to chime in with the Vanderbilt, the Urbana, and all the rest of them, and decide that if the locust gives one mild kick at the air "immediately about it," then the mass of four cubic miles goes to work with its "*elasticity*" and squeezes and shakes and churns itself with a mechanical energy equal to the displacement of 2,000,000,000 tons of solid matter, and keeps up this energy as long as this little insect keeps kicking! What an insult to natural philosophy, and everything worthy of the name of science! Who ever before heard of "*elasticity*" as a mechanical force? "*Elasticity*" can accomplish absolutely nothing, and cannot even be utilized to produce motion till the elastic body is first compressed or expanded by an extraneous mechanical agency, which, in the case of the four cubic miles of air, must be the physical exertion of the locust, since clearly there is no other mechanical force to do it. Why, a boy who has just begun to study natural philosophy ought to know this. The first law of motion, universally accepted as correct, teaches that a body at rest remains at rest till it is put into motion by an extraneous force, and that the body cannot move of itself by any inherent qualities, properties, or characteristics it may possess. Is it possible that Prof. Carhart has not yet learned this first law of motion?

If some other mechanical force could be brought into play by the call of the locust sufficient to compress the mass of air and thus make its "*elasticity*" available, then it and not the sound would do the shaking. To illustrate: A nicely balanced and tensioned electric key might be connected with a wire leading to a hundred tons of dynamite distributed under the four cubic miles of air. A locust by singing *unisonantly* with the key might throw it into sympathetic vibration and cause it to close the electric-circuit, and thus, as an indirect or remote cause set off the explosion. By the added mechanical force of expanding gas thus generated the air could be compressed, its "*elasticity*" brought into service, and the whole mass might thus be shaken with a force of 2,000,000,000 tons. But of what avail would be its "*elasticity*," without the application of this extraneous mechanical agency?

Plainly in the case in controversy the stridulation of the locust is all the mechanical force there is in the premises, and if it does not shake the mass of air, *then positively no motion in the mass takes place*, which of course is the truth, though it annihilates the wave-theory! It must be true, since no man pretending to teach physics, unless he be a fit candidate for an insane asylum, seriously supposes that this mass of air could shake itself into "condensations and rarefactions" without some adequate mechanical force to utilize its elastic property. Yet it is a startling fact that Professor Carhart can see no shade of difference between the above illustrated addition of the mechanical force of exploding dynamite and the absolutely helpless *property* of "elasticity"! He positively urges that the "elasticity of the air" adds to the trifling act of the insect the same compressing energy as does the exploding dynamite. We are not misrepresenting him. Here is the proof:

"As well assert that the little daughter of Gen. Newton tossed up the rocks at Hell Gate by her tiny hand, when she closed the key of the electric circuit and exploded the dynamite!"

But stop, Professor; you have forgotten your North Western philosophy! What use was there for dynamite in the premises? None whatever. The little girl simply *moved the key*; the wire then took up the motion, and conveyed it "from particle to particle," "through the agency" of the *flexibility* of the wire, till it reached the rock which then shook itself to pieces and tossed itself into the air "through the agency" of its "inherent characteristics"! Of course it did! Of what use, then, was this extraneous mechanical force of exploding dynamite after the initial motion of the little girl's hand, when a mass of four cubic miles of air can shake itself with a force sufficient to displace 2,000,000,000 tons of solid matter "*through the agency*" of its "*elasticity*," with only the mechanical kick of a locust to start it?

Is it possible, is it conceivable that a great university has to be taught this elementary principle of mechanics? Why, according to this unnatural philosophy, the "*elasticity*" of the clock-spring ought to be able to wind up the clock by the impulse of the last tick of the pendulum, and thus start it for another 24 hours' work! By all means let Prof. Carhart get out a patent at once for an everlasting clock that when it runs down shall be able to wind itself up by the "*elasticity*" of its spring and thus make his everlasting fortune! Talk about a "reputable physicist" not being capable of teaching "infinitely impossible consequences" after this! Why, Tyndall's "tin tube" is nowhere to this patent "elastic" everlasting, self-winding clock of Prof. Carhart!

But, seriously; how preposterous to suppose that one of the mere *properties* of a body, such as its *elasticity*, *combustibility*, or *flexibility*, could go to work and manipulate it and thus cause it to do mechanical labor! As well suppose a bar of copper to be capable of drawing itself out into wire "through the agency" of its *ductility*, without the aid of an external mechanical force, as to suppose the air capable of shaking itself, and thus bending "in and out" millions of tons of tympanic membranes "through the agency" of its "*elasticity*!" The whole thing is a bald farce in science, and too insufferably shallow to be worthy of a reply.

Yet we are constantly forced into just such elementary explanations of the first principles of natural philosophy in order to enlighten the great professors of physics in our colleges and universities. Particularly does such an exhibition of intensified ignorance inspire one with a feeling of disgust, presented as it here is by a conceited sciolist who sneers contemptuously at more than ten thousand learned and pious ministers of the gospel for commending a book, the principal part of which he confesses to having never read!

In this apparently pitiless exposure of the Professor's want even of an elementary knowledge of physics, we entertain not the slightest feeling of unkindness or resentment toward him, and he must not so take it. We aim not so much, however, to silence a professor, whose stupid criticisms deserve no such extended consideration at our hands, as to warn other and more prominent professors of physics who might be tempted recklessly to assail this "locust argument" against the current theory of acoustics and thus ruin their prospects for life, as several of them have already done. Neither have we in these pointed animadversions done the professor's criticisms the least injustice. The entire drift of his reasoning and illustrations carries out this same want of depth in his scientific education, though he adheres strictly to the text-books in the general discussion.

He conscientiously thinks that this mass of air shakes itself by the mere property of its "*elasticity*" after the locust disturbs the air immediately in contact with its body. As further proof, look at his fatal illustration of a vast plain set with 2,000,000,000 tons of bricks on end so near to each other that by pushing over the first brick (as the locust pushes the first cubic quarter inch of air) it falls against the next and topples it, that against the next, and so on till the 2,000,000,000 tons of bricks are all pushed over, as he claims, by the end of his finger! But here again the same lack of scientific discernment and grasp is lamentably manifest. As evidence, note his question which follows this illustration:

"*Would any sane man assert that I had actually exerted a force equal to 2,000,000,000 tons by the impulse given to the first brick?*"

Of course not! No "sane man" would suppose that he had exerted a force of more than about two ounces! But unless a man was either insane or an idiot, he would suspect, if he did not assert, that it took just as much mechanical force to push over the second brick as the first, and the third brick as the second, and so on throughout the 2,000,000,000 tons of bricks. No man but a consummate ignoramus, unfit to hold any position in a college, would assert that those millions of tons of bricks pushed each other over by their inherent properties, such as *hardness*, *impenetrability*, or *elasticity*, even if such stupid puerility should be found in the text-books. Nothing could push over the second brick, or the third brick or any other brick on the vast plain save a *mechanical force* external to the brick itself equal to the two ounces, and that mechanical force, in the present case, is the earth's gravity. Thus while the professor would only exert two ounces of force in toppling the first brick, gravity would take hold of that brick after the professor's finger had done its work, and add another two ounces of force by which to topple

the next, and so on till it had exerted the displacing force of the millions of tons necessary to overturn all the bricks on the plain. Thus the fallacy as well as irrelevancy of the illustration becomes apparent on its face. To make the two cases at all analogous let us suppose these bricks to be poised on the plain in equilibrium, like the air-springs of the wave-theory, and all connected one with another by springs, each of which requires two ounces of mechanical force to compress it and thus permit its brick to move. In this case gravity acts no part whatever, just as it has nothing to do with the countless millions of air-springs that must be compressed by the sound of the locust, according to the wave-theory, in order to generate the required heat and also to bend tympanic membranes wherever the sound is heard. Now we are ready for an *honest* illustration; not for a kind of patent-safe trick, surreptitiously employing the enormous mechanical force of gravity and leaving the impression upon the reader that the millions of tons of bricks toppled themselves over by their "inherent characteristics" after the first brick was pushed!

Having the bricks thus arranged, the same as the air-springs according to the sound-theory, let the professor now push the first brick with a mechanical force of two ounces, thus compressing its spring, and of course, according to this North Western philosophy, all the rest of the millions of springs will communicate the motion from one to another "*through the agency of their elasticity*," and will thus displace the 2,000,000,000 tons of bricks without the expenditure of another ounce of mechanical force! The very statement of such "infinitely impossible consequences" ought to make every man who teaches the wave-theory hang his head in scientific disgust; for such a mechanical result is exactly what the theory teaches in the case of the locust. Yet there is not a bright boy ten years old in America, whether he has ever been to school or not, who does not know, if there were 1,000 bricks thus connected by two-ounce springs, and if they all moved on shoving the first brick, that the professor would have to exert a mechanical force of 2,000 ounces by the pressure of his finger in order to effect the result. But Prof. Carhart here confesses that he does not so understand the natural philosophy in the case. On the contrary he distinctly tells us that if he shall push with a force of two ounces, so as to compress the first spring, this motion will "travel from particle to particle," or from spring to spring, and that the remaining 999 bricks will be moved "*through the agency of the elasticity of the*" springs!

Had we space to spare, every criticism of the professor would share a similar fate with this, because the wave-theory here being demonstrated to be false, no fact in acoustics can fairly be construed in its favor. This is the law of logic laid down by Prof. Huxley, as quoted in the "*Problem*," at page 325, which has never been disputed, and never will be by a logician, namely, that if one single *fact* is shown positively and unmistakably to be against a theory, it is as good as "five hundred;"—"such hypothesis falls to the ground," however many other facts may seem to favor it. What then becomes of the wave-theory when all the facts, fairly construed, are against it? We need not

therefore write a book every time we reply to an assailant. We must trust a little to the intelligence of our readers who cannot fail to see that if this chief criticism is thus disastrously turned against the wave-theory, the others would vanish before our pen like chaff before a tornado.

And now a single remark. Be it known to professors of physics everywhere, that the foregoing reply to Prof. Carhart is the true reason in principle why no answer to our sound-departure has been attempted by Profs. Tyndall, Mayer, Helmholtz, and the leading physicists of the world; and not, as Prof. Carhart charges, because of their silent "contempt" for the "ignorance and shallowness" of the author of the book. No, no; no! Those great physicists do not require more than a scientific kick before they can take the "amusing" hint. They are none of your inexperienced professors to run into a trap with their eyes open. They are not to blame, of course, for having held to the wave-theory any more than a man is censurable for inheriting the gout from his progenitors. But they saw at a glance, and to their amazement, on reading *Evolution of Sound*, that the wave-theory had received its death blow, though, as all admit, by a very crude and unpolished instrument having many bad nicks in its edge and faults in its hilt. But this did not make the cut less painful. Hence, under their covert attitude of "silent contempt" they have wisely determined to avoid the inevitable disaster which their mother-wit told them awaited those who should recklessly venture to defend the theory. A few, like our present critic, whose unsophistication is only equalled by his conceit, instead of following the safe example of Tyndall and Mayer in playing the game of "contempt," venture like the wise lad to touch the smooth edge of the circular saw, because, forsooth, they are incapable of seeing its teeth. These are among those who proverbially can learn in no school save that of experience.

But we cannot dismiss our critic without a single reference to the literary qualifications of the man who, without reading the book (as he so frankly confesses he has not done), sweepingly sneers at the thousands of educated ministers and college professors who, after having carefully read it through, commend the work to their friends in the strongest terms as worthy of general circulation. Here is a single specimen of his classical style which will consign him to his appropriate niche in the literary temple of fame:—

"It is not necessary to point out the *ridiculous character* of this new theory of *sonorous emissions* and *substantial emanations* of Mr. Hall. They are *self-evident*!"

Poor Carhart! His bad grammar lured him into the truth just once in the whole four columns! He tried to say that the "*ridiculous character* of this new theory" is "*self-evident*," but, Balaam-like, he opened his mouth to curse Israel and it came out a blessing! He positively asserts that the "*sonorous emissions* and *substantial emanations*" "*are self-evident*!" That is exactly what many other distinguished physicists are coming to think. By the way, cannot the North Western University turn Balaam's Ass just long enough to rebuke the madness of this prophet she has been so patiently carrying? or, perhaps, it would be more to her credit to stop short, as did the

original onkey, and pitch him against the wall. One thing is certain, there is a drawn sword in his path whether his eyes are yet opened to see it or not.

UNIVERSAL SALVATION.

BY JUDGE O. S. POSTON.

The learned Editor of *The Microcosm*, in reply to my article on Universal Salvation, has presented but one issue: and that is that the text I quoted from Mark, "Blessed are ye poor, for yours is the Kingdom of Heaven," contains no promise that the poor of this world will be compensated for their sufferings here by the happiness to be enjoyed in the future life. I thought that the numerous sayings of Jesus relative to the poor, and the fact that he required his disciples to divest themselves of property before they could become his followers, were more than sufficient to sustain the literal meaning of the text. But as the Editor has challenged me to produce three texts that will sustain my doctrine, I will present them for the consideration of the readers of *The Microcosm*.

In the fourth chapter of Luke we are informed, that Christ preached a sermon in a Jewish Synagogue. The text he read was from Isaiah, and commenced with the words, "The Spirit of the Lord is upon me because He hath anointed me to preach His gospel to the poor," &c.

And his sermon was short and pertinent. He simply said, "This day is this scripture fulfilled in your ears."

We thus see what was his mission as indicated by prophecy, and also his special indorsement of that prophecy.

On another occasion a young man came to him who said he had kept all the commandments from his youth up, and asked what he should do to inherit eternal life; and Jesus said to him, "One thing thou lackest; sell whatsoever thou hast and give it to the poor, and thou shalt have treasure in heaven."

Again, where any doubt exists as to the doctrines taught by Jesus as constituting his gospel, assuredly those who were his apostles, and upon whom the Holy Spirit had descended that was to teach them all truth, would certainly understand and carry out practically his teachings.

When the original Christian Church was organized at Jerusalem, we are told in the Acts of the Apostles "That the disciples sold their possessions and goods and parted them to all men, as every man had need." See *Chapter*.

These texts illustrate theoretically and practically the principles and doctrines that were taught by Jesus and accepted by his apostles. Indeed, when he gave the great commission to his apostles to preach his religion to the world, he added this injunction, "teaching them to observe all things whatsoever I have commanded you." See Matth. 28: 20.

Thus much for scripture authority. As I said in my former article, some reason should intermix with all dogma, and I desire to say that I have never heard or read a single rational argument that would show that there was any propriety of inflicting the penalty of

eternal damnation on any human soul. When we reflect that not a single human being chooses when or where he will be born, and that all the circumstances of his life, including parentage, education, religious culture, and whatever conduces to make him what he will be when he reaches the period of moral responsibility, are the results of inexorable destiny or blind chance, over which he has no control, to assign such person to eternal perdition for not ascertaining which is the true religion, and hurriedly accepting its dogmas and living up to the code of morality taught, is a doctrine too absurd and monstrous to receive credence in the minds of rational beings.

But the opposite doctrine presents God as a kind, merciful, considerate and rational Father who will never expect imperfect humanity to accomplish more than He has given it capacity and power to do.

Viewing him in that aspect, we can well perceive why we were commanded to love our enemies, forgive all injuries, and do good to all men, that we might be perfect even as He was perfect. Mankind would naturally love and worship such a God, and the reflex action of His character, ever held in remembrance, would persuade us to that universal love for our common humanity that no other faith will ever promote or secure.

HARRODSBURG, KY.

REPLY TO THE FOREGOING.

Pleased as we are with the amiable spirit of Judge Poston's contributions, we cannot suppress our astonishment at their self-disintegrating character. After our reply to his former article we really expected that he would have taken warning and not lay himself liable to similar criticism. By reference to his former article, Vol. II., page 265, it will be seen that he quoted from Christ's Sermon on the Mount the passage he requotes at the head of his present paper, "Blessed are ye poor, for yours is the Kingdom of Heaven." It will be remembered that the Judge applied this passage to the future life, and to the Kingdom of ultimate glory. There could, of course, be no mistake about this, or otherwise the text was no evidence at all in favor of universal salvation. This the Judge concedes in his present letter by not objecting to our construction of his proof in our reply as it occurs at page 319 of that volume. In that reply we quoted numerous sayings from that same Sermon on the Mount, making this very same beatitude and this "Kingdom of God" and "Kingdom of Heaven" conditional and dependent upon the conduct and characters of men in this life. We showed that the very fact of quoting from this Sermon which so manifestly makes future salvation conditional was not only a tacit but an explicit surrender of Universalism. There is not a jurist in Christendom who would not throw a case out of court based on such self-nugatory testimony as that.

But strange to say after having thus quoted Christ's truthful teaching about the "poor" in which He distinctly makes future salvation conditional and dependent upon the characters which men form in this life, the Judge now, without trying to explain his former escapade, quotes Christ again in regard to the "poor" in order to make him flatly contradict himself, as it would seem, by teaching Universalism.

To show, however, that there is no such contradiction of the Sermon on the Mount, let us look at the Judge's new testimony for a minute.

We admit of course that Christ was anointed to preach the gospel to the *poor*, even in the literal sense of the term "poor." Why? Because "the gospel is the power of God unto salvation." Rom. 1:16. But does Judge Poston mean to tell us that any man, poor or rich will receive and enjoy this *salvation* "which by the gospel is preached unto you" unless he accepts it? If he does, he teaches the most unscriptural and heretical doctrine ever promulgated by man. So far from it Christ preached to Jerusalem,—poor and rich,—"How often would I have gathered your children together as a hen gathereth her brood under her wings, but *ye would not*" — "*ye would not* come unto me that ye might have life." The difference between the gospel that Christ was anointed to preach, and other forms of religion was, that it was entirely free to the *poor*;—it could be had without money and without price. But what religio-philosophical heresy to say that when salvation was thus freely offered, those who wilfully rejected it would be forced to enjoy it anyhow because they happened to be "poor"! No; he said to his ministers—"Go out into the highways and hedges and *compel* them to come in," morally of course. But suppose they refuse to be compelled, will the master of the house send out the food from his table and have his servants force it into the mouths of those who thus refuse to come into his house and eat? No; if, after all persuasion or moral compulsion is exhausted, the poor refuse to come in that his house may be full, then the master of that house will declare that such ingrates shall never taste of His supper.

Here is the Judge's second and surprising text, confirming this same view. The rich young man asked Christ what good thing he should do "to inherit *eternal life*," which is here necessarily admitted to refer to the future state, or else, of course, it is no proof. Why did not the Saviour answer him as does Judge Poston? No good thing at all, sir, for you shall have "eternal life" any how, in the future state, whatever character you may form here! This is no misrepresentation of the Judge's views, or else he is manifestly no Universalist. If he believes in accordance with Christ's answer to that rich young man, that he must sell his goods and give to the poor, or do any thing at all, in order to "have treasure in heaven," then he has forever abandoned Universalism, for this text makes "heaven" or "eternal life" conditional and to depend upon our actions here. Was ever anything more indubitably taught in Scripture? Yet, amazing to record, Judge Poston quotes this very conclusive text as a part of his proof that *heaven* and *eternal life* are unconditional!

We agree with the Judge that where any doubt exists as to the meaning of Christ's teaching, we have a right to go to His apostles as commentators. And when we go to them we find their uniform doctrine and teachings to accord exactly with Christ's answer to that rich young man. Shall we give the Judge a few samples of the apostles' exegesis of Christ's historic answer? Here they are:

"And being made perfect he became the author of *eternal salvation* to all them that obey him." Heb. 5:9.

"Work out your salvation with fear and trembling." Phil. 2:12.

"Blessed is the man that endureth temptation, for when he is tried he shall receive a *crown of life* which the Lord has promised to them that love him." James 1:12.

"In every nation he that *feareth God* and *worketh righteousness* is accepted of him." Acts 10:35.

"Know ye not that the unrighteous shall not inherit the Kingdom of God?" 1 Cor. 6:9.

"Wherefore he is able to save to the uttermost them that come unto God by him." Heb. 7:25.

A hundred such passages can be found in the apostolic writings agreeing in all respects with the Saviour's answer to the young man, making heaven, the Kingdom of God, and eternal life conditional upon the character we form here. What folly then in seeking to make them contradict or modify this explicit inculcation of the Saviour!

What the practice of the early church (in putting their goods together and giving liberally to the poor) has to do with the doctrine of universal salvation or our discussion, may be clear to the mind of a Judge, but we confess that to us it is a little obscure.

We do not deny but that "some reason," as the Judge says, should intermix with theology. But is it reasonable that wicked people; those that delight in unrighteousness, and in their lies and abominations, should be coerced into the Church of Christ and into the society of the good and pious here against their wills? The Judge, of course, would answer, No. Is God a tyrant? Is He cruel or unmerciful because he lets wicked people have their own way here in the practice of all kinds of ungodliness? The Judge undoubtedly must answer, No. Well now, Judge, we have you fast. Your doctrine tells us that these abominable characters are now, yes *now*, in *hell*, suffering the pangs of the "everlasting punishment prepared for the devil and his angels";—in the "lake that burns with fire and brimstone," in which "the worm dieth not and the fire is not quenched," and that all the other direful threatenings of the New Testament are *now* being executed against these poor sinners! Yet a merciful and kind and benevolent Father allows them to spend a whole lifetime in this "weeping and wailing and gnashing of teeth"; yet all these years of torture are so pleasant and enjoyable on the part of these reprobates and outcasts that no amount of persuasion can induce them to step out of this burning brimstone of Universalism into the delightful blessedness of the gospel of peace! Now, Judge, is it chilling to your merciful nature, and does it benumb your generous heart to think that the same merciful Father, who permits His dear children to remain a whole life-time in the torments of hell, which they choose and prefer above all other things on earth, will allow them to remain in a similar hell of their own choice forever? We are willing to let you define the "*hell*," and the "*torment*," and the "*everlasting punishment*," of the New Testament, and then compel you to answer our question as to its duration. And as you tell us that the wicked are now suffering the very hottest hell there is or ever will be, and since we know that they would be glad always to be kept in just such a "*hell*," and to enjoy forever just such a delightful "*tor-*

ment," we do not think it should chill any good man's sensitive heart to think that the same kind Father would in the next life set apart certain bounds for those who prefer hell to heaven as a matter of choice, and thus allow them to enjoy hell as a permanent abode!

Now what say you, Judge? Would such an accommodating arrangement for the wicked in the next life, which you proclaim to be the worst hell there is threatened in the New Testament, cause you to lose a single night's sleep should you be convinced that God would certainly so provide for his wayward children in order to separate the sheep from the goats? Seriously, whatever plan you will adopt to justify the mercy, goodness, foreknowledge, and omnipotence of God, in allowing people to remain in hell-torment three-score years, we will adopt to vindicate His character and attributes in thus obliging and accommodating the wicked forever. When you shall answer this argument, based as it is upon your own definition of hell-fire, we shall have a few other arguments to present based upon our definition of the New Testament doctrine of future punishment.

A KINDLY NOTICE OF OUR WORK.

WE have received a copy of the *Dallas (Texas) Mercury* of July 1, containing the opening address at the joint entertainment of the Literary Societies of the Normal Institute at Huntsville during Commencement Week. The subject was, "The Night Brings out the Stars," and was eloquently discussed by the orator of the occasion, Charles F. Crutcher, Esq. We make the following brief extract from the address, referring incidentally to our work, not out of the least personal vanity, but in justice to the cause for which we labor, that the readers of THE MICROCOSM may see that the efforts of their journal and its editor are telling upon those who think:

Thus we see that man, physically, mentally and morally, is susceptible of cultivation to almost an infinite degree. And thus the night of trial brings out the stars of character in their full-orbed beauty. It does this by compelling him to do his utmost, by forcing him to be original, and to learn well the lessons of life; whereas, if reared in the lap of luxury, his powers might remain dormant, or only be partially cultivated. If the muscles of the "brawny arm" are ever to be as strong as iron bands, they must be exercised. So with the mental and spiritual part of man. Time forbids mention of but a few of the countless number of eminent men that have risen from poverty high up the hills of fame. Prominent among the men of letters, may be mentioned Shakespeare, Milton, Burns, Ben. Johnson, Samuel Butler, author of "Hudibras," of whom it was said: "He was indebted for a grave to the pity of an admirer." John Bunyan, the "unrivaled allegorist," was a tinker and rose from the lowest rank of society. Among the men of our own country stand Webster, Clay, Calhoun, and our lamented statesman and historian, Hon. Alexander H. Stephens, of Georgia. And among the last presidents of the United

States, are Lincoln, Johnson, Grant and Garfield. Last, but by no means least, is one who possesses the physical, mental, and moral qualities in a high degree of perfection. I refer to A. Wilford Hall, of New York city, the author of "*The Problem of Human Life, Here and Hereafter*," the Editor of "*Wilford's Microcosm*," the scientific champion of the Bible and Christianity. The man who has shown the absurdity of philosophic theories that have stood the test for ages; exhibited the erroneousness of "Newton's Principia," has scientifically demonstrated the immortality of the soul, and in whose giant grasp such men as Darwin, Tyndall, Mayer, Helmholtz and Haeckel, are said to be "mere pigmies." The man who, a few days ago, was to "fortune and to fame unknown," but to-day is enshrined in the hearts of his countrymen; the man who in ages to come, when thrones have crumbled and dynasties have been forgotten, will stand the landmark of his country's genius.

BEGINNING OF A NEW VOLUME.

How the months do fly! It seems but half a year or less since we wrote our inaugural editorial for the August number of Vol. 2. We have been too busy and too much absorbed in the great controversies which characterize this magazine to note the inevitable flight of time. But the calendar does not lie. Another year has flown, and we are one more year nearer the end of our earthly work. Still personally,—both physically and mentally,—we feel even stronger than when we issued the initial number of the preceding volume. Our energies seem to grow by what they feed on. We love controversy when it tends to the development of what we regard as truth in science, philosophy, and religion. "Contend earnestly" is no less an injunction for those working in the field of science and Nature than it was in the times of the apostle who penned it and for the contest to which it then referred.

As we write we let our mind sweep back over the past twelve numbers of Vol. 2, and we cannot and would not ignore the fact that real progress has been made—that we are nearer the end when *substantialism* is to become an established fact, than we were a year ago. No one not familiar with our files of letters which have reached us during the progress of the past volume, and which are now reaching us by the hundred as we go to press, can begin to know the extent of the enthusiasm of our subscribers generally over the contents of original matter which flow like an endless river through these pages. All concur in saying that no such journal, for number and variety of religio-philosophical and scientific discussions, every one of which is original matter, has ever before found a place among their current literature. For this we are indebted to our grand army of contributors—the immortal 40 whose names head our editorial page, subject to occasional shiftings as new contributors temporarily take the place of old ones. These inimitable writers have, and are justly entitled to, most of the credit for making *The Microcosm* what it has grown to be. We never can thank them enough.

And now we have space only to say that a new campaign begins under the most favorable auspices. Our old subscribers are renewing

with great promptitude, every one of whom sends his dollar with a letter of congratulations on the grand success of the volume just closed, and a majority of whose remittances are accompanied with the names of new subscribers. To one and all we here tender our heartfelt thanks, with the promise that no effort on our part shall be lacking to make this volume even superior to either of its predecessors. With an abiding faith that the same kind Providence which has sustained our hand and strengthened our heart during the past years, will still in His own way keep us in the work till it is finished, we ask His blessing upon this magazine and upon every reader of the same.

PROF. STAHR IN THE REFORMED QUARTERLY.

As announced and foreshadowed last month, we have received and read the promised review of our sound-departure in the July number of the *Reformed Quarterly* from the pen of Prof. Stahr of Franklin and Marshall College, Lancaster, Pa. To say that we are disappointed does not half express it. We marvel at the extent of our disappointment. We naturally looked for a very able and critical review, and even suspected that possibly some new and very difficult things in favor of the current theory of acoustics, or at least against our arguments, would be sprung upon us, judging from the commanding character of the *Quarterly* which was to publish the review, and the heralded scientific reputation of the writer. But on reading it through carefully, we drew a long breath and felt forced to declare, in the language of Mark Twain's *Immocents Abroad*, "There's nothing in it"! This is the literal truth. A weaker attempt at breaking through our arraignment of the current theory of acoustics, with perhaps one exception, has never fallen under our notice in the fifty or more set reviews that have appeared in different journals within the last two years. It not only bristles with superficial and platitudinous proofs of weakness at the turn of every paragraph, from the beginning to the end of the 24 pages of the *Quarterly*, but it abounds in first-class self-contradictions and unmistakable evidences of incapacity to grasp original ideas in physical science.

In view of this manifest harmlessness of the entire article with those who think, we have decided to postpone our reply to it till next month, especially in consequence of so many important arguments upon the same subject in this number of *THE MICROCOSM*, previously promised. In fact we would not deem the review worthy of a reply at all but from its pretentious source and the high character of the publication which has so unfortunately lowered its journalistic standard in giving it to the world. In the mean time we ask Prof. Stahr, and all (if there are any such) who think he has made a single point that will stand, to read elsewhere our reply to Prof. Carhart's review and our answer to Prof. Cook on "Sound Interference." These two replies will possibly

give Prof. Stahr and his friends a mild foretaste of what he may expect next month.

A "PERSONAL REMINISCENCE."

We had intended to print in this number of *THE MICROCOSM*, in compliance with many requests, the promised "personal reminiscence," extending back a period of thirty-four years of our life; but on fuller reflection we have thought it wise not to do so for the present. The occasion does not yet seem to be quite ripe for such a draft upon the credulity of our readers as the startling, though truthful, story would necessarily make. Consultation with a very dear friend has induced this postponement. We concur in such advice, namely, that our work has not yet advanced far enough to warrant such a personal narrative. We wish in fact no attention to be directed to ourself, any further than it will aid the cause of truth, but to devote *THE MICROCOSM* entirely to the accomplishment of its destined mission of pulling down the strongholds of false science and the establishment of a broad philosophical and religious substantialism upon a firm basis on their ruins. When this work is more fully under way and better established, we may draw upon the patience of our readers to indulge us in a little authobiography merely as a matter of record.

DR. KAVANAUGH ON THE MOON.

We have received Dr. Kavanaugh's article in reply to our June criticisms of his theory of Electricity as the motor-power of the solar system. The article was received too late for this number of *THE MICROCOSM* the entire part allotted to set contributions being in type. However, it will appear next month, with a few brief comments of our own. Of course, the Doctor's article is devoted entirely to the solution of the problem as to how the moon gets around the earth by electricity without the aid of gravity, both spheres being "negative" bodies. It will interest the reader to get such important information.

ARTICLES LEFT OVER.

Again we have to report that a number of valuable articles from contributors, as well as important editorials, are crowded over to next number, some of which we positively expected and even promised would appear in this number. Several of these are in type, in our anxiety to give our readers more than *THE MICROCOSM* will hold, without bursting. But we have deemed it prudent to keep out a part of this literary and scientific dynamite lest we should have a *magazine* explosion. Among the articles left over are our replies to Prof. Cather, of the *Weather Indicator*; to the *South Western Methodist*; and also our comments on the new departure concerning the Rams' Horns blown before Jericho. They will all appear next month.

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SUBSTANTIALISM AND REDEMPTION.

BY REV. F. HAMLIN.

In his Lecture on "Certainties in Religion" Joseph Cook says: "We are going hence"—"We want to go hence in peace." And "to go hence in peace we must be in harmony with our environment which consists of Conscience, and of God, and of our record." Speaking of the atonement he quotes the statement or admission of an unevangelical Boston scholar, "There is a difficulty in conscience as to our peace when we once have sinned; and that difficulty in the structure of human nature, has sustained the doctrine of vicarious atonement, before the attacks of philosophy century after century." But if you please consider

I. *If the theory of "Substantialism" is untrue, it cannot be shown that man needs redemption from sin and its punishment.* Doctor Hall in *The Microcosm* for July, says: "Let Christian Theists once concede to Scientists that sound, light, heat, gravity, &c., are but modes of molecular vibration, and not real entities, and immediately the shrewd atheist will ask, 'If all these natural phenomena are but modes of motion then what reason is there for believing that the energy manifested by life, soul, &c., is anything more than a similar motion of Brain-particles.'" Following out the analogy he shows that if mind is (as sound is claimed to be) only a "mode of motion," then it must "cease to exist whenever the man dies, and his brain molecules cease to move," and that thus orthodoxy is tied "helpless at the feet of Materialism." And we add, if the soul is only a "mode of motion" it is not entitative, if not entitative then not personal, and if not personal then not responsible, and if irresponsible then not capable of sinning, and if not capable of sinning, and thus not liable to punishment, no redemption is necessary. And if redemption was unnecessary then either Christ's death (a well attested historical fact) was that of only a man, or else God the father was cruel, and the Son was foolish, and this lands us in blank atheism, for a cruel or foolish God is a contradiction in terms. Such is the logical outcome of this "mode of motion" theory. But perhaps you will say to me "I cannot ignore the testimony of *Consciousness*, nor the voice of *Conscience*. I am conscious that I am a person; that I am responsible; that I may, and that I have sinned, and you tell me (with James Freeman Clark) that the "inward voice of Conscience, is always saying that God ought not to forgive us without some reparation made for the injury done to himself, to the universe, and to ourselves." You tell me that you trust for Salvation here and hereafter in the merit of Christ's Death. Why, sir,

II. *IF THE THEORY OF SUBSTANTIALISM IS UNTRUE THE WORLD IS TO-DAY WITHOUT A SAVIOUR.* I say it *boldly*, if the theory of substantialism is untrue, the world is to-day without a Saviour! 1. *If Jesus Christ is the World's Saviour, his ability and worthiness surely in-*

heres not so much in his human purity, as in his Divine presence and worth. Reason suggests that the demands of infinite Justice could only be met, and salvation from eternal misery could only be reached through the interposition and propitiation of an *infinite* Saviour. Abstract humanity could no more buy heaven than could a handful of dust purchase a Gem. It was the Divine in Christ which made Salvation possible. As Bishop James once said, "A man could suffer, but he could not satisfy, a God could satisfy but could not suffer; but in the God-man we have a suffering and a satisfying Saviour." The Divine was the "Diamond in the Ring" which made it valuable.

2. *But whence came and what was the Divine in Christ?*

What was it? Not material, for Divinity is infinite. Matter could only be comparatively infinite in quantity or magnitude, and Jesus possessed only the proportions of a man. Nor could it have its origin from the material, for it was *forceful*. I know Tyndall's superficial materialism attributes to matter the power to originate force, by giving to matter a wholly new definition, and what he vaguely calls a spiritual side. But Prof. Bain who leads the acutest and most recent materialism, admits that matter cannot originate force. If with Sir John Herschel we deem it reasonable "to regard *gravity* as the present effort of a will"—then we must admit the same truth concerning that power which *overcomes gravity*, and causes a heretofore dead Lazarus to arise and walk, or a slumbering Arimathean to leave his rocky niche, and walk to Emmaus. Now consider that Experience and Observation teach us that a present Will always keeps company with an Emotional Nature, and these join hands with intellect, and all together constitute personality, and as like begets like, and as the Divine in Jesus did not originate in matter, this Divine is necessarily an *immaterial*, personal entity, and in such a powerful infinite Redeemer we may safely trust. But if in this world, only the material exists, then Jesus was *purely finite*, and as such incapable of redeeming men, and we are to-day "of all men most miserable." We now pass to notice

III. *The philology of Scripture settles conclusively the question concerning the substantial nature of the second person of the Trinity, &c.*

Paul was a substantialist. He who believed in the existence of an "inward" as well as an "outward man," speaks in Heb. 1, 3, on this point. There God is represented as speaking to us by his Son, who is "*the express image of his person*." The word *charakter* here translated "image" means not only image as the impress on a coin, or "a peculiar mark of distinction," but also "the peculiar nature and character of a thing." (Plato Phaed. 263 §.) Thus we learn that Christ had the exact nature and character of God the Father. Now what that nature was, we learn from the examination of the word here rendered, "*person*" *hupostascōs*. It means "steadfastness, endurance, firmness, base, bottom, support, stay;"

it signifies "the solid part of anything, as opposed to that which drains off" (rather hard on Materialism; my body is as running water, compared to the rocky soul beneath or within it); it means "starting point," "beginning" (rather severe on the theory of mind and thought originating by molecular action; it proves the reverse); it means "real being" as opposed to mere appearances, hence called (as we have it in the New Version) "Substance" as if all else were but shadow. No wonder that Moses and Elias when they talked with Jesus on the mountain, spoke not of his "decease," but of the *exodon*—the "exodus" which he should accomplish at Jerusalem. This is the same term which in the Greek version of the Old Testament, as in our own English Bible, is the name of the Second Book of Moses that tells of the outgoing of the tribes of Israel from Bondage to Freedom. These two men knowing more about the nature and imperishability of spirit than do we, spake to him, not of his *death*, for that did not touch the spirit, but of his "outgoing which he should accomplish at Jerusalem." He was ere long to go out and across the trackless desert of space over the sea and rise into the New Jerusalem, above whose temples blaze in sunny splendor and music rings eternally. The talk of Moses and Elias was not about death, but *it was a talk about Home*. Thus we see that just as Genesis proves substantialism to be dominant in the vegetable kingdom, so Hebrews proves Christ a substance distinguished from matter.

From the foregoing we make the following deductions:

1st. *That Spirit or Substance is the most real thing on earth.* God is substance, and that is most real which is most like him.

2d. *That Man is immortal.* He was made in God's image, and God being substance, man could not receive his qualities or image unless like him substantial. Abstract matter cannot think, nor impel, nor as one has said "have a sense of oughtness." If like God, *substantial*, he is like God immortal.

3d. *That the intelligent Christian cannot consistently withhold his support from any man who seeks to emphasize the reality of the invisible substantial, and the folly of the materialistic philosophy.* If substantialism be nothing more than an absurd theory, and if mind and soul are but "modes of motion," then the word sinner is meaningless; the Cross of Jesus useless, the Church of God worthless, and the dying man hopeless. If this be so, let professed Christians, who are opposers of Substantialism, be consistent; tear down their churches, repeat French history on American soil, and write over the entrance to every Cemetery "Death is an eternal sleep." But if Christ be really *substance*, indestructable and immortal, and if his brethren are like him destined to live forever, then they should "lay aside every weight" (especially that weight of cowardice which holds down so many who are already intellectually convinced of their duty), and seizing the sling of truth hurl the smooth stone into the very forehead of the Goliath of Materialism.

POUGHKEEPSIE, N. Y.

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FREE TRADE AND PROTECTION.—No. 1.

(A Review of Prof. Sumner of Yale College, and Hon. David A. Wells, in the *Princeton Review*.)

BY ISAAC HOFFER, ESQ.

Prof. Sumner of Yale College in the March number of the *Princeton Review* of 1881, treats of protection as a restriction on trade by an unjust and odious system of taxation.

He declares that "any favor or encouragement which the protective system exerts on one group of its population must be won by an equivalent oppression of some other group." This same idea he repeats eighteen times. In one place he argues that "the tariff can only increase wages in mechanical pursuits by deducting from the gains of agriculture"; but soon follows by asserting that the tariff "lowers wages." "It never has had and never can have any other effect." In another place he states that "they" (the protectionists) "persuade the people who pay nearly all the taxes on consumption—namely, the artisan and laborer—that they could not get their living on this continent if they did not pay taxes."

Hon. David A. Wells in the Nov. number of the *Princeton Review* of 1882, asserts that Federal taxes both direct and indirect are levied on commodities, fall on consumption and must be paid by the consumer in the increased price of the things he consumes. Hence it follows that the burden of such taxes must be disproportionately heavier on the man who from necessity expends all or nearly all his wages, salary or other income in mere living than he who only expends one half, one third, or a smaller portion of his income for like purposes."

These positions, that protection takes from one group and gives it to another; that the laborer pays an unjust proportion of the tariff; and that agriculture loses by increased price of commodities and receives no benefit from protection form the gist and bulk of the leading arguments against protection.

If the tariff on all cotton, woolen and linen goods, not made in this country, would be twenty per cent., then, according to the first position the producer would "win by an equivalent oppression that amount from others," or, as Mr. Wells puts it, the "increased price would have to be paid by the consumer." This could only be true when the producers are not consumers and the consumers not producers; but the people of the United States are all consumers or users of cotton, woolen, or linen goods, and therefore they would all help to pay the twenty per cent. tariff each according to the quantity and the quality or value of the goods used. Hence there is no oppression of one group for the benefit of another, but a general tax paid by all in as fair a proportion, if not fairer, than taxes usually are paid. It is therefore clearly an error to hold that the collection of duties on foreign goods is taking taxes from one class of people for the benefit of another; and it would be worse than an error to discriminate against our own industries, by levying Federal taxes on their productions, to meet the necessary expenses of the Government, as we would be compelled to do under free trade.

But when the protective system becomes prohibitory then we are told "the increased

price must be paid by the consumer to the producer." Here again it must be remembered, that the people of the United States are all consumers, and also all producers or dependents upon producers, and that not one portion pays the advance to another; but that all pay the increased price, each according to the quantity and the quality used. The people being producers of raw materials, and manufactured commodities, or otherwise dependent upon productions, the increase in price occasioned by protection simply raises the standard of values; for in a free country where every person can employ his capital and his labor according to the chances of greatest profit, there must be an equilibrium in profits; and there can be no extortion of excessive gains by one class of citizens from another. The cry in this country against monopolies is a "hollow mockery" for there are no monopolies except those obtained by letters patent on new discoveries, the justice of which no one disputes. There are advantages of established business reputation, concentrated capital, and unusual natural resources, but no special privileges which are not open to competition, and therefore no monopoly. If the people were divided into classes of producers and consumers, and if there was no law of equalization in profits, then the position that the increased price of protection must be paid by the consumer to the producer would not be an error; but as competition and the struggle for gain bring all profits speedily to a general level, that plausible position and logical conclusion is nevertheless clearly an error.

The position that the laborer pays an unjust proportion of the tariff would be true if the necessities of life were equally taxed with other property, but fortunately for the man "who expends all or nearly all his income in mere living," and unfortunately for the arguments of Prof. Sumner and Mr. Wells, but a very small portion of the necessities of life are burdened with any tax whatever. Bread, meat, vegetables, and fuel are not taxed, and the common grades of clothing are as cheap in this country as in any other. A detailed statement giving the exact amount of the tariff paid in one year for the necessities of life by a man who earns a dollar a day would no doubt greatly surprise Prof. Sumner and Mr. Wells. It seems almost impossible that eminent writers should base one of their leading arguments against protection, on a position so utterly void of fact, and where the facts in the case are so glaringly apparent.

"Farmers pay an unjust proportion of the tariff without receiving any benefit from it."

So far as household goods and clothing are concerned the farmer pays the same proportion as the laborer, the mechanic or any other person. On agricultural implements he pays what protection adds to the price under free trade. How much does protection add to the cost of a stock of agricultural implements amounting to one thousand dollars? Or how much cheaper can a farmer buy such a stock in free trade England than in protected America? Is it not a well known fact that agricultural implements can be purchased cheaper in this country than in England, and that they are superior in efficiency and durability to the English? It is therefore also an error that the farmer pays an unjust portion of the tariff;

for on agricultural implements he does not pay a single cent for increased price by protection.

The position that the "farmer derives no benefit from protection" is equally untenable.

A bushel of wheat must bring \$1.25 in Europe when the price is ninety cents in Chicago before it can be shipped. The consumer therefore pays thirty-nine per cent. more than the producer gets; and the middle man takes the difference. But if the consumer and the producer were brought together the thirty-nine per cent. would be saved to them jointly, and the farmer would receive at least half the amount saved. On meat and corn about the same percentage would be saved. This, however, is but a small part of the advantage of having the farmer and manufacturer in close proximity. The value of the manufacturer's improvements, and the improvements necessary to accommodate his labor, are all additions to the wealth of that community; and the advantages to trade incident to such establishment, and of the money circulated in its vicinity, add greatly to the general prosperity of the neighborhood; and none are more benefited than the owners of the soil and the producers of food and raw material. A striking illustration of this fact can be seen in a comparison between the County of Lehigh, in Pa., and the County of Jefferson, in W. Va. The geological features of these two counties are almost identical (being in the same valley) the natural fertility of the soil is the same, the climate differs but little, and the proximity to market and the advantages for shipping produce are nearly alike; and yet good farms in Lehigh County, Pa., sell about three hundred per cent. higher than in Jefferson County, W. Va., notwithstanding the fact that according to the census reports of 1860 and 1870 Jefferson County, W. Va., raised more wheat in proportion to the whole number of acres under cultivation than any other County in the United States.

There is no reason why land in Jefferson County, W. Va., should not sell just as high as it does in Lehigh County, Pa., except that in the latter County there are diversified industries and in the former not. It ought to be self evident that diversity of industries gives the greatest attainable prosperity to a country, and that it benefits the owners of the land and the producers of food and raw materials more than any others, by bringing wealth to their community, consumers to their doors, and by diverting capital and labor from entering into ruinous competition. If the greater part of the capital and labor employed in manufacture would be transferred to agriculture, as it would be under free trade, the farmers best market—the home market—would not only be lost, but competition in the raising of food and raw materials would be so increased as to be ruinous to agriculture.

THE SECONDARY CORRELATIONS OF FORCES.

BY ELD. C. S. TOWNE.

I will introduce these secondary correlations by this question: Is the Bible God's book and the record of his will? The skeptical scientist rejects God's Providence and Word from the

fields of human research as unscientific because involving faith in the unseen. But when we observe the wide range of human action we see that one individual consciousness alone plays through both planes of his action; and we also see that the plane of thought embracing the unseen is immeasurably higher than the plane of the seen and physical action, and constantly controls it. Hence, we never study human handiwork without taking into account all the complicated influences of human thought expressed in speaking or writing; and these influences of thought are appropriated by a constant exercise of faith in what other men have said and done out of our sight. Then if the seen and the unseen spheres of human action can never be separated, but must always be observed and studied in connection, it logically follows that the seen and the unseen of the superhuman can not be separated, and we must study what God is doing and has done in Nature, in constant connection with what he has thought, said, or written out of our sight. Therefore the scientist is never so unscientific as when he rejects the action of faith which alone can lead him to an enduring knowledge of the substantial and causative, yet unseen verities of the universe. The correlations I now present show how the primary correlation is acted out. They are parallel and co-ordinate, one being the action wholly of divine power; the other the action wholly of human power. I call your attention first to the human correlation.

The first link embraces the action of living men working with their hands, or by means of mechanical instrumentalities. We see here not only manifestations of individual force, but we also see that the aggregate action is itself a force that moves other persons to corresponding lines of action. Correlated to this we have the finished results of labor remaining with us after the actors are gone from our sight. These objective records of past action exert upon us in some measure the same influences exerted by the living actions that produced the results.

In the second link we have the power of a living spirit speaking to enlighten and educate the spirits of those more ignorant than the speaker, thus opening the eyes of their understandings to the comprehension of truth. Correlated to this we have the same spiritual power exerted through written words with the same result as that accomplished by the spoken words; and unless there had been a conscious spirit to speak, there could not have been this recorded spiritual force, this written conservation of the spirit's energy.

In the third and last link we have a living soul speaking to command and control the actions and to bring into exercise the passions of other souls. Correlated to this we have the power of a soul exerted through written words to accomplish the same ends; and if there had not been a conscious soul to speak, there could not have been this written conservation of the soul's energy. But as the energies of soul and spirit are so united as to work through one body, so we find their recorded forces mingling upon the same page. How manifestly imperfect would be this subordinate chain of correlation if there were no written records of the speaking powers of human soul and spirit! How low and debased the condition of society if the works of our hands were

the only recorded evidences of the tireless energies within us! We see clearly that it is wholly natural and reasonable that man should record his ideas in writing for the present and future benefit of his fellow men. Would it not, then, seem natural and reasonable that God our Father should do the same thing for the benefit of the race throughout all ages of its existence? As it is undeniably true that the links of this subordinate correlation of human forces acted and spoken on one side, and recorded in objects and written words on the other side, must all work in harmony to educate a child up to the full enjoyment of human brotherhood. I think we must admit the necessity of a corresponding correlation of Divine forces whose perfect action is absolutely required to educate the race to the full understanding and enjoyment of the Fatherhood of God. I pass, then, to consider the link of this divine correlation.

We see around us from day to day those evolving activities which suggest to us the intelligence and power of an Infinite Being. Correlated to this present action, we have in the rocky strata the remains of strange animals and plants testifying that in past ages God worked with the same designing intelligence and tireless energy that speak his wisdom and power to-day. As we have seen by the law of the Equivalence of Energy, and by the facts of the primary correlation, that the unseen One is a speaking Being, we must admit as the second link of this correlation that to the spoken power of the divine Soul there must be correlated the written record of that power having the same authority and influence as the spoken words.

Lastly, to the spoken power of the Divine Spirit, there must be correlated the written record of that power possessing the same enlightening influences as the spoken words. Is the Bible such a record? Is it indeed the conservation of the Divine energy? Do the moving influences of the Bible stand in a line with those of Nature, yet upon an ascending plane reaching infinitely above Nature in their transcendent powers of enlightening and blessing mankind? The influence of mind upon mind is governed by law. The ratio of this influence is in proportion to the powers of mind in the person exercising that influence; and the index of that person's power is found in the influence of his words, either spoken or written. In accordance with this law the Bible is the only book whose influence far above that of all other books combined, does correspond with the influence which an all-wise Mind should exert over the finite minds of men. No other writings flash and thrill with such intensities of electric power, striking down every form and semblance of injustice, oppression and sin. No human recitals of history can vie with the Divine stories in their compact clearness, simplicity, and soul-subduing sweetness. No human powers of argument and reason can draw the finite spirit with such magnetic power to the perception of truth as do those Bible teachings which have come to us in the demonstration of the Holy Spirit and of power. If the universe of Nature points to a Builder and Maker whose ideas of external form and beauty and delicate construction must be so infinitely various, the Bible also points to One as its Author whose mind must be an inexhaustible treasury of knowledge and wisdom;

whose thoughts are unsearchable, and whose ways are past finding out. Triumphant, then, we present the Bible as a perfect and harmonious part in the correlations of the universe. In Nature we see the continuous on-goings of the Divine silent action responded to by all animated creation in an infinite variety of unworded melodies ascending as sweet incense to the God of Nature. In the Bible we see recorded upon a higher plane the spoken action

of a personal God, responded to only by the comprehending intelligence of a human soul and spirit in the far sweeter incense of a personal love and obedience to laws that can only be expressed in words as the signs of ideas which can never, never descend into the lower plane of silent or unspoken action. Let me now present these correlations within the limits of a glance.

PRIMARY CORRELATION.

Divine Soul, Spirit, and Body.

| Human soul, spirit and body.

SECONDARY CORRELATIONS.

1. Divine silent action.
3. Spoken action of Divine Soul and Spirit.

2. Objective record of that action.
4. Written action of Divine Soul and Spirit.

1. Human silent action.
3. Spoken action of human soul and spirit.

2. Objective record of that action.
4. Written action of human soul and spirit.

These correlations embrace all the possible activities of the universe radiating from the throne of God forever. Without God the primal chain of correlation drops into chaos like a rope of sand. With a personal God the chain is complete. Without the Bible, the divine subordinate correlation is broken

and all swept away save the silent working of an impersonal force personified as "Dame Nature." With the Bible, the subordinate chains are both perfect, and all the requisitions of the great problem of the universe are satisfied.

COBDEN, ILL.

THE FREEDOM OF THE WILL AND CERTAINTY.

BY PROF. I. L. KEPHART, A.M.

In my preceding articles, the position has been maintained that the Will is free. This is conceded by the great mass of thinkers all over the world. Without it moral government would be impossible. Without it man would be incapable of virtue. Without it punishment for wrong-doing would be a useless, inexcusable cruelty, and remorse of conscience an impossibility.

But it is maintained by the great majority of respectable theologians that, while all the responsible moral actions of men are free—that they are the results of their own free choices and acts—nevertheless, all those acts are absolutely certain years before they are performed; aye, from all eternity. They maintain that although men, in order to be responsible, rewardable, or punishable for their acts, must necessarily act freely and not from extraneous coercion, yet it is absolutely certain as to how they will act. Their position is stated very concisely by Dr. Gregory in "*Christian Ethics*," Page 144. He says:

"True freedom in action, while not consistent with necessity, is nevertheless not inconsistent with certainty. An event may be absolutely certain without being necessary. If a man have good principles, and all temptation to do wrong be removed, it is morally certain that in any given case, he will do right. But there is no compulsion in the case and therefore no necessity. It is absolutely certain that God will always do right, but he is nevertheless infinitely free in doing right. It may be absolutely certain that in a manufactory, in any given week, a definite amount of the fabric there manufactured will be produced, and yet both the proprietor and the operatives are perfectly free in their planning and working. *So all the results of the ongoing of the Universe may be perfectly certain, and yet all the intelligent agents employed in it may be truly free.*" (Italics mine.)

As this is regarded as a concise and conclusive proof that the free acts of moral agents can be and are, at the same time, "perfectly certain," it is worthy of special notice. To the assertions contained in the first two sentences quoted, no exception is taken. They are true, and accord with reason and the facts in the case. Neither is the assertion contained in the third sentence denied. But it may be well to notice its hypothetical character, and then inquire as to the inference to be drawn in case the conditions named are not fulfilled or do not exist. "If," says the Doctor, "a man have good principles, and all temptation to do wrong be removed, it is morally certain that, in any given case he will do right." But how is it in case "all temptation to do wrong be" *not* "removed?" Must we not, in that case, by parity of reasoning conclude that it is *not* morally certain that he will, in any given case do right?

But in this world, man being in a state of probation, "all temptation is" *not* "removed." The very idea of probation embraces the idea of trial—temptation. Webster defines the term thus: "moral trial; the state of man in the present life, in which he has the opportunity of proving his character, and being qualified for a happier state." Hence, we see that human moral actions in this life, do not come within the conditions specified by Dr. Gregory as essential to the certainty of free actions; and as they do not come within the conditions essential to the certainty of such actions, they cannot be and are not certain. (To the logical mind, the query here arises, how can even the Omniscient one know, as a *certainty* that which at the time is necessarily and absolutely *not a certainty*? But the answering of this question is left for those who contend that man's will is free and his moral acts are free, and yet that they have all been absolutely *certain* from all eternity, or for those who in effect, contend that because God is omnipotent, he must be able to make a door to be open and shut at the same time.)

To prove his point farther, the Doctor says: "It is absolutely certain that God will always

do right, but he is nevertheless infinitely free in doing right." But this does not weigh the weight of a feather in the direction of proving the certainty of the moral acts of free agents who are in a state of probation, because the cases are not at all analogous. God is infinitely perfect, pure, good, and holy. He is not subject to temptation, nor is it possible to tempt Him to do evil. He is not in a state of probation, but man is; and being so, he (man) is, as shown above, exposed to temptation. The first pair in the garden certainly had good principles, for their Creator pronounced them good; but being finite and exposed to temptation, while there were many reasons for believing that in such a pure state they would cling to the right and resist the wrong, nevertheless, they yielded to the temptation and fell. Free will and probation combined render the certainty of the future choices and acts of the probationers absolutely impossible. The moment it becomes absolutely and beyond the possibility of a doubt *certain* that all the future choices and acts of a good man will be in accordance with right, that moment his probation is virtually ended. That moment his character is fixed; not that he cannot do the wrong in the future, but because it is morally certain he *will not* do it.

The Doctor says: "It may be absolutely certain that in a manufactory, in any given week, a definite amount of the fabric there manufactured will be produced, and yet both the proprietor and the operatives are perfectly free in their planing and working." This case is not at all parallel with the case that involves moral character and final destiny. Hence if the assertion were true, it would prove nothing as to the certainty of the actions of free moral agents in matters that involve and determine final destiny. Nevertheless when we look at the sentence, we find that the assertion must be taken with much allowance. Is it true that "it may be *absolutely* certain that in a manufactory, in any given week, a definite amount of the fabric there manufactured will be produced?" All manufacturers know it is not. A thousand and one things may transpire during the week to vary the amount of fabric produced. The manufacturer may change his mind, and the running of his mill at any moment. One or more of the operatives may conclude to quit, and because his place cannot be instantaneously filled by another who is equally expert, there is a change in "the amount of fabric produced." There is only one conceivable condition under which it can be "*absolutely certain* that in a manufactory, in a given week a definite amount of the fabric there manufactured will be produced," and that is as follows: The machinery must all be so perfect, and the free agents at the beginning of the week, all so completely agreed as to what they will do during that week, and so completely removed from all inducements to change their mind and from every external influence that would interfere with their carrying out their intentions, that it is absolutely certain, *at the beginning of the week*, that there will, during the week, be no change in the machinery, the proprietor nor in any one of the operatives. Then, *and only then*, can it be "*absolutely certain*" what the product of the week will be. But will the advocates of the certainty of free actions contend that this was the case with all the machinery and agencies of

the universe *at the beginning*? They must if they agree with Dr. Gregory's conclusion, for he says: "So," (in like manner with the manufactory) "all the results of the ongoing of the universe may be *perfectly certain*, and all the intelligent agents employed in it may be truly free." This conclusion leaves no place for probationers in the universe of God; for bear in mind, that, according to the Doctor's previous statement, it is only when all temptation is removed from the good man that it can be certain that he will in any given case do right. Dr. McCabe says: "It is a simple fact that a being who was and who ever had been most thoroughly just and holy did inaugurate wickedness and did introduce moral evil into the universe. We have no right or authority or reason, therefore, to anticipate with certainty that a being who is thoroughly just and good will always, during his probation perform good deeds."

Julius Müller says: "We never can predict with anything but an approximate probability what the decision of a man of developed character will be, even when the web of his inner life in its finest and most delicate threads lies before us. This is so because character, in its earthly growth, is never so fixed and certain as to be unsusceptible of new and different determinations from the inexhaustible source and depth of free will, which can sever the threads and introduce therein new ones." The conclusion is that the freedom of the will and the certainty of the choices and acts of probationers are necessarily and absolutely incompatible.

AN ARROGANT HIERARCHY.

PROF. EDWIN R. GRAHAM, A.M.

Many outrages on common sense, many crimes against reason, have been committed in the name of science. And because the perpetrators each assume the proud title of Philosopher, the world at large must crook the pliant knee to these insolent priests in the philosophic hierarchy. With sublime assurance they tell us they have spoken with Nature face to face, as friend to friend. They have witnessed her cunning operations in the mysterious caverns of her laboratory, and to them alone has it been given to interpret and promulgate her laws. Experience is the basis on which they build their conclusions. That which has been, may be; but they cannot bridge the chasm between the visible cosmos and the unseen universe. Intelligence can be brought into contact only with molecules and ether. These form the substance of the universe. Sense is the only source of knowledge, and Force is the unseen and only Soul of things. Out of all these audacious assumptions, behold they erect the structure of Evolution.

"Physical Science," says one of the most competent of them, "is the knowledge of the relations between natural phenomena and their physical antecedents, as necessary sequences of cause and effect; these relations being investigated by the aid of mathematics. There is no admission to any but a mathematician into this school of philosophy. But there is a lower department of natural science, most useful as a precursor and auxiliary, which we may call scientific phenomenology, the office of

which is to observe and classify phenomena, and by induction to infer the laws that govern them. As it is unable to determine these laws to be the necessary results of the action of physical forces, they remain merely empirical until the higher science interprets them."

By mathematical investigation is meant, a method in which the processes of reasoning on all questions that can be brought under the categories of *quantity*, and *space conditions*, are rendered *exact*, and simplified, and made "capable of general application to a degree almost inconceivable to the *uninitiated*" by the use of conventional symbols. It will be observed we have two schools of philosophy and two orders of philosophers,—two classes of workmen, as it were—the skilled artificer and the hod carrier. A beautiful and suggestive picture might be drawn, representing Büchner, Bastian, Darwin, Haeckel, and Tyndall handing up bricks and mortar to Clerk Maxwell, Sir William Thompson and Helmholtz. Underneath we write the title: The Building of the Temple (of Evolution). From the definition of physical science given above, we learn that only philosophers of the "first class" can interpret natural law. They alone are capable of discerning *exact science*, and therefore they alone are competent authority. That the hypothesis of evolution rests on the solid foundation of exact science, as affirmed by its advocates, or on science of any sort, is bare assertion and bald assumption. To prove this, we propose to take the evidence of a few scientists whose claims to a position in the "first order" admit of no dispute.

To Dr. Büchner's assertion that "the naturalist proves that there are no other forces in Nature besides the physical, chemical and mechanical," Dr. Elam replies: "Once for all, it cannot be too clearly understood that this claim is utterly without foundation. No vestige of what can be considered *proof* of the doctrines of materialism, has ever been offered. Now, as two thousand years ago, they rest only upon arbitrary *conjecture*." The "most accomplished naturalist in England," St. George Mivart, has pronounced materialistic evolution a "puerile hypothesis." Agassiz, whose name is both honored and honorable, doomed it to a pitiless and destructive criticism. Professor Virchow has been characterized as opposed to every species of orthodoxy and altogether innocent of faith. Surely he may be depended upon to advocate the theory. On the contrary, in his reply to Haeckel, he declares that it is little more than a famous and long-since exploded doctrine, and affirms that "*all real scientific knowledge proceeds*"—out of pity we hate to complete the sentence—"All real, scientific knowledge *proceeds in the opposite direction!*" This is too bad. He attacked Darwin most vigorously, and gave to the circle of evolutionists the name of "bubble companies." Professor Tait, of Edinburgh, does not deal with them more gently in giving a "scientific estimate" of the pretentious sciolism engaged in blowing the bubbles. He says: "There is a numerous group, *not in the slightest degree entitled to rank as physicists*, who assert that not merely Life, but even Volition and Consciousness are physical manifestations." He lays violent hands on Tyndall's experimental science, saying, "it gives itself airs, as if it were the mistress instead of the handmaid, and often conceals its own incapacity

and want of scientific purity by high-sounding language as to the mysteries of nature. It endues matter with mysterious qualities and occult powers, and imagines that it discerns in the physical atom the 'promise and potency of all terrestrial life.'" From such evidence we can arrive at no conclusion other than this: Exact science, interpreted by its own oracles, does *not* establish nor sustain the hypothesis of evolution, but does proclaim its absurdity.

Science, so called, delights in "high-sounding" phrases. Sublime truths are best expressed in simple language. "In the beginning God created the heavens and the earth" is authoritative by virtue of its very simplicity. The word create needs no definition as evolution does. And what a definition! "Evolution," says Herbert Spencer, "is a change from an indefinite, incoherent homogeneity to a definite, coherent heterogeneity, through continuous differentiations and integrations." An English critic translates as follows: "Evolution is a change from a nohowish, untalkaboutable all-alikeness to a somehowish, and-in-general talkaboutable not-all-alikeness, through continuous something-elsefications and stick-togetherations." The translation has a great advantage over the original. It is clear and intelligible, and brings out the full meaning of the word evolution, as used by philosophers of the "first order."

There are many readers of the *Problem* and the *Microcosm* who are thoroughly convinced at heart, but are restrained by pride or vanity from admitting the cogency of Dr. Hall's reasoning. They have adopted a scientific creed, couched in learned but unintelligible language, and fancy they are in goodly company. For the prostitution of their reason, they are permitted to bask in the luster of distinguished names. They must decide for themselves whether they will accept as science the rubbish of conjecture, covered by the dust and must of twenty-five hundred years, or throw behind them the traditions of the schools, and take a stand with ELAM, MIVART, VIRCHOW, AGASSIZ and HALL. If Prof. Lupton, of the dental department of Vanderbilt University, can be prevailed upon to do so, he will draw a sigh of relief as he wakes from his dream of "respectability," to find himself in better company than he imagined. We should reject as truth that which has only antiquity to recommend it; and if reason lights our pathway from Here to Hereafter, we need not fear being betrayed by the glare of false science, which "leads to bewilder and dazzles to blind."

FAIRVILLE, MO.

IS MAN'S RELIGIOUS NATURE AN EVOLUTION?—NO 4.

BY REV. JOS. S. VAN DYKE, A. M.

To say that religion is the product of human thought, is to do more than enter a protest against emotional forms of piety; it is a practical denial that man came from the hand of his Maker a religious being. To consider the knowledge which comes to us through the laws of thought the sole source of religion, is somewhat like tracing the river to the stagnant pool at the foot of the mountain, but refusing to press to the crystal fountain that bursts forth from the

sides of the everlasting hills. To believe that religion is man's production, may produce a rather pleasant sensation, but it quite evidently fails to meet the demands of a rigid investigation. If it is the mere excrescence of human thought, why are all, even lowest savages, susceptible to its impressions?

Though there are some reasoners who are disposed to assert that there is in nature, independent of a superintending being, an orderly arrangement which evinces the existence of an all-pervading intelligence, and that this intelligence, in whatsoever organisms it manifests itself, is self-evolved—the same in kind, differing merely in degree—and that man's religion is a result of self-acquired knowledge; still, it is safe to affirm, that the vast majority of the human family, can never be induced to surrender the belief, that the spiritual element in human nature is an original and essential characteristic, the immediate creation of the First Cause of all things.

Even granting that the religious sentiment principally "busies itself with a wish, a hope and a fear," it certainly does not follow that it has no nobler origin. Because a philosopher employs his reasoning powers upon the metaphysics of religion, are we at liberty to infer that his discursive faculties had their origin in the love of abstract thought?

This same school of religious thought assumes that a myth is necessary to religious belief in pre-historic periods, and even since in some nations. A myth is defined as an endeavor to realize the unknown, as a power to grant or refuse a wish. The motives impelling to this attempt, are affirmed to be "an innate consciousness," "a force," and "a succession of changes," with "a yearning to explain existing phenomena." Whence this "innate consciousness?" Whence this indefinable "yearning?" If we were to affirm that they were implanted at man's creation, could the statement be disproved? To say the least, Christians have as good a right to ask their adversaries to undertake its refutation, as they have to expect us to refute their unfounded assertions. Certainly the Scriptural doctrine is quite as satisfactory, and more logical, than the theory which assumes that religion is a result of evolution, a development from the lower animals, without even an original germ of religious feeling.

Whilst it is patent to all, that evolutionists make no effort to show us how the higher forms of human thought have been developed from animal instincts, it is scarcely less evident that in the endeavor to evolve the germs of intellect, of moral sense, and of religious emotion, they proclaim themselves alchemists in physiology, successors in a higher sphere of the chemical alchemists of the dark ages. Mingling animal ingredients, and repeating an incantation, composed of fanciful analogies and adroit assumptions, they confidently affirm that they are able to distil human essence, whence may be evolved all the races of men, and even the most marvelous works of human genius, no Creator being needed, unless, possibly the hypothesis of his existence may be necessary to account for the origin of one or two primordial germs of life. Perhaps they may find themselves pursuing a mere illusion. It is possible, however, that like their renowned predecessors, they may stimulate investigation, which, notwithstanding the incidental mischief

done, may result in establishing truth on an immovable basis.

MYSTERY OF GRAVITATION UNRAVELLED.

DEAR DR. HALL. Your very kind letter is at hand. I cheerfully respond to your suggestions, and send in a nut-shell "The Mystery of Gravitation Unravelled," with outline of proofs, as follows:

1.—The direction of movement indicates the direction of the moving force at the moment of communication to the moving body: hence attraction results from a force coming into the spheres which affects all bodies coming within its range.

2.—Light proves the existence of an interstellar medium; for if a wave motion there must be something to move, and if an emitted substance it must occupy all space, since it has been shed forth incessantly for ages and from innumerable sources. But the fact of a vast ethereal ocean, from its gaseous nature and consequent tendency to enter the space occupied by the spheres, necessitates the communication of a balance of force to the latter. This shows that gravitation originates from the presence of matter in any degree condensed in the midst of a more ethereal surrounding. It is imperceptible in its incipency; but as the matter of the universe becomes massed in the spheres, and the force becomes massed in the interstellar medium, the tendency of force to an equilibrium becomes more marked, and the force-vacuum of a dense globe is filled with a rush as now observed. But lest some should imagine a more mysterious origin, I make the argument hinge on the fact rather than the explanation.

3.—In the nature of the case the force entering at every point of the surface must be focalized at the center, and force arrested assumes the mode of heat. The heat producing power of solar gravitation is estimated thus: The force of gravity at the surface of the earth is represented by about 15 lb. to the sq. in., at the surface of the sun it is about 28 times as great or 420 lb. to the sq. in. multiplying by the number of sq. inches in the surface of the sun we have the whole force represented in pounds. One pound falling 772 ft. produces heat sufficient for raising the temperature of a pound of water 1° F. The constant increase of velocity of a falling body shows the rate of accumulation of the heat-producing force per second. From these data I have estimated the amount of heat produced by solar gravitation and found it about fifteen times the amount of sensible heat emitted by the sun as estimated by Dr. J. R. Mayer and Prof. Tyndall.

4. Universally accepted science declares that the whole force must reappear,—centrifugal force is but a small fraction of gravity, hence the remaining quantity must reappear as the latent heat of an ethereal substance generated by the action of intense heat upon the material of the sun, and expelled through the mass into surrounding space. The solar ray is therefore to all appearance demonstrated to be an emitted substance. But should it be thought necessary to reconsider the accepted dicta of science we are ready for the emergency and can in the

meantime prove our position another way, thus: The heat focalized by a six foot reflector vaporizes platinum. About one half the crust of the earth is said to be oxygen which appears in air as a gas. Evidently all substances will vaporize under intense heat,—but the heat focalized at the center of the sun is the greatest known to the universe, and it must act instantaneously; besides such intense heat could not be eliminated by any known process but that of etherealization, without constantly increasing the temperature of the whole mass, and by plain inference the formation of a cool earth like ours would be impossible. Steam carries off the accumulating heat of boiling water; but if the process of conduction were sufficient for this purpose, it would be impossible to heat any thing without at the same time heating everything around it.

6.—The mighty swell of the generated gas, in its demand for outlet through the mass of the sphere, is the origin of centrifugal force suggested by this theory, and I venture to assume that no other rationally sufficient cause can be thought of. To say that centrifugal force results from revolution on axis, is like saying that the force of gun-powder results from the movement of a cannon-ball; and to assume the existence of an all-pervading ether, without any natural process to produce it, is no less ridiculous, especially if we think of cold material ether going in through the mass to the center of the sun, and *staying* there, to carry off in waves of heat, &c., the reactionary force.

Thus the veil is drawn, the mystery is unraveled. If after the keenest scrutiny I shall be found, even in the main, correct, we have a fundamental discovery in Natural Science, and a glimmer of light thrown on the most mysterious phenomena: The escaped ether fills all space, furnishing, in the course of ages, the substantial base of new clusters with suns, planets, comets, moons, and meteors. Earthquakes and volcanoes, in so far as they manifest a giant force seeking liberation, will be looked upon in a somewhat new light. Cohesion, chemical affinity and magnetism will be rescued from the realm of mystery, since matter moves according to the same laws whether in the aggregate or taken in detail. And the manifest circulation of the forces, and commingling of the atoms of the universe at large, remind us so forcibly of the circulation of the blood and the process of waste and repair in our own bodies, that, were it not for fear of presumption, we might be ready to conclude that as we have found a way of producing light and heat so very superior to combustion, so we have found in this circulation and commingling, a new proof of a life and intelligence infinitely superior to our own.

In conclusion: The problem of the universe is reduced to that of the egg and bird. Which was first? The spheres are produced from the ether and the ether from the spheres. Without the ether the spheres could not produce ether, and without the spheres the ether could not produce spheres. At least if the matter and force of the universe were equally distributed there could be no gravitation, which is the same thing. And while we may run the alternate changes back into the indefinite past, or even admit an infinite series, in either case, the manifestations of life and law and beauty and intelligence that now proclaim the exist-

ence of the Living God, have done so in accents just as loud and unmistakable at any period of the past. Away then with vaunting atheism from this, another of its fancied strongholds, while we go on with our prayers that our holy Christianity may continue to triumph and reign forever more.

Hoping that this brief statement will prove in some degree satisfactory, and thanking you sincerely for this hearing,

I remain, &c.,

J. J. FINLAY.

NORTH WASHINGTON, O.

REMARKS ON THE FOREGOING.

With all our mental concentrativeness, and with all due respect, even esteem for our friend, the Rev. Dr. Finlay, we make the open confession to him and to our readers that his solution of the mystery of gravitation is too heavy for our intellectual muscle. In fact we fear that the solution needs unravelling as much as the original "mystery" of gravitation. Possibly this is all due to our mental obtusity. Hence we print the article first, because it is well written and we know the Doctor to be a close thinker; and second, because we hope that we have readers who are better at seeing the point of solution in an "unravelling mystery" than we are. At least we feel sure that many of them have more time to devote to it than we have, that is, if they have any time at all. So we submit it as a philosophical puzzle. This is not said as a disparagement of the Doctor, however, for we feel sure that he knows whereof he writes. The disparagement is all aimed at ourself.

THE METRIC SYSTEM.

BY PROF. T. C. WILHELM, A. M.

Whether anyone else will consider it worth while to reply to the article in the July number of the *Microcosm* by Prof. Graham on "The Metric System," and thereby forestall this writing by something better, I do not know. On first sight it seemed as if Prof. Graham could scarcely be in earnest. It looked very much as if intended for a burlesque on the old system, instead of a defense of it. But in the absence of any other evidence of such intention, except the utter inconclusiveness of the reasoning, I suppose we must take it for what it purports to be, viz.: an honest effort to defend the old irregular tables of weights and measures, and show their superiority over the new. And as there are, doubtless, some who will be convinced by the "respectability" of Prof. Graham, in spite of his false reasoning, perhaps he ought to be answered.

But surely very few readers would fail to see that the method of reasoning employed by Prof. Graham is just as good for the new system as for the old, and if applied to the old in the same manner, would produce precisely similar results, to the disadvantage of that system.

His method is to take an integral or exact number of units of any given denomination of the old tables, (as 32 miles) and convert them into their equivalent in the Metric System, and then because the units of the one system are not commensurable with those of the other,

array the string of decimals resulting from the process as evidence of the cumbersomeness of the Metric System. The same thing precisely would result from the conversion of 220 kilometers, or 22 myriameters into their equivalent of *miles, furlongs, rods, yards, feet, inches and decimals of an inch*, to say nothing about *ells, quarters, nails, lines, &c.* There would be no more need to use too large or too small a unit in any case than there is in the use of our Decimal Money table. We are not compelled to read \$54.75 as *five Eagles, four dollars, seven dimes and five cents*, as Prof. Graham implies that we must do in the case of the similarly constructed tables of the Decimal system of weights and measures. As for the nomenclature, if it can be improved, let it be improved by all means. Surely nobody will object to any genuine improvement.

But it is implied all the way through Prof. Graham's article that there is some virtue in a mile as a standard of measurement, and so of a pound, an acre, a quart, &c., &c., over a corresponding weight or measure of a different system. In fact it is implied that we must always want to speak of an integral No. of miles or acres, &c. Why should we want to speak of 22 miles any more than an exact No. of units in the metric system? How does "a piece of paper" come to be exactly "7 inches long and 5 inches wide," rather than 7.0009 inches long and 4.9999 inches wide? Only because the inch being the present standard of measurement, somebody tried to make it an exactly even No. of inches long and wide. If the length and width were made to vary from this exact No. as above, then the area would not turn out so beautifully to be exactly 35 square inches, but 35.00379991 inches! A piece of paper 3 decimeters long and two decimeters wide will contain just 6 square decimeters. But express that in square inches, and what will it be? We will not take up the space to show it. "Labored expressions," indeed! If we had the other system in use, what would we want with your old *miles, furlongs, rods, etc., etc.*? It may be difficult to introduce. So is Christianity, and true Science, and phonetic printing. But is that anything to their discredit? Let Prof. Graham make some genuine discovery, and try to introduce it. We shall then see whether he considers the difficulties he encounters in introducing it to the favorable consideration of those who are prejudiced against him and his discovery, as a real defect in his discovery.

Now all we should need to do in order to show up the ridiculousness of the Old System of weights and measures on Prof. Graham's plan, would be to copy his article, substituting "Metric System" for "English System" and *vice versa*, and using integral units of the Metric System where he uses integrals of the English *mutatis mutandis*. Who would exchange our American table of money for the old English pounds, shillings, pence and farthings? All the other tables of the Metric System bear a similar relation to the corresponding ones of the Old System, to that which our American money table does to the English. Its simplicity and facility of use is its claim to superiority, and the ridiculous effort of Prof. Graham to disparage it must convince every thinking person either that the Old System is

utterly indefensible, or else that it needs better defenders.

PETERSBURG, PA.

THE ZION'S HERALD CONTROVERSY.

We have received many letters from our subscribers, particularly among the Methodist clergy, calling our attention to the discussion that has occurred about the *Problem of Human Life*, in *Zion's Herald* (Boston), between Prof. Geo. H. Stone of Colorado Springs, and the eminent scholar and divine, Rev. B. F. Tefft, D. D., L. L. D., of East Poland, Me.* These correspondents urgently suggest that we give room in *The Microcosm* for Dr. Tefft's letter, which we herewith do, copying it as it appears in the *Herald*. We preface it, however, with the salient points of Prof. Stone's letter as follows:

"Consider it, brethren! Jesus lived among us and died that He might deepen and intensify the Godward forces on the earth. He left His Paraclete to testify of the truth, but He was careless about the relations of His enunciated moral truths with the true interpretation of material nature. Although He ought to have known the secrets of physics and biology, yet He said nothing concerning material and natural science, the essential nature of the human soul, or of "the problem of human life;" so His cause goes from bad to worse until the information which He saw fit not to reveal is supplied by "a God-indited book," by which "the Bible is saved and the Christian faith is redeemed." As we think of this Christian champion, who, according to his admirers, has saved Christianity, there comes into our minds the memories of another Christian champion, who was also confronted by cultured unbelievers. Probably no one could better have battled the scoffing Greek philosophers than the apostle Paul, at the time when he invaded Greece, to capture that classic land for the despised Nazarene. What a volume he was capable of fulminating against the philosophers, meeting them on their own ground! And yet, although his lofty spirit was stirred by the mighty mental stimulus of the place, he determined to know nothing among them save Jesus and Him crucified. Think what an opportunity was thus lost! In all probability he could have shown that the philosophers were in serious error as to physics, biology and psychology. By exposing their scientific errors, he would have made them ridiculous and discredited them with the masses, while his brethren would naturally rend the skies with their shouts of victory over the defeat of the unbelievers, and would spend their time in discussing the true Christian theory of acoustics, the real or essential nature of the soul, etc. Doubtless Paul could (on their own ground) have refuted the atomic theory of Anaximander, Heraclites, Empedocles and Lucretius, and perhaps he could have "knocked the evolution doctrines of the so-called scientists into

* An important letter appeared from the pen of Dr. Tefft in the first volume of *The Microcosm* (now bound in cloth, p 311), giving his impressions on first reading the *Problem*.

smithereens" as pulverizingly as Mr. Hall is said to have done some centuries later. What an oversight it was, that both Jesus and Paul left that atomic theory unscotched to become the seed of new evolution doctrines in the future!"

[From *Zion's Herald*.]

THE "PROBLEM OF HUMAN LIFE" CONSIDERED.

BY REV. B. F. TEFT, D.D.

Among men of marked intellectual character, as I have many times observed, it is not regarded as a sign of mental soundness in a person, if, whenever he reads a newspaper article containing things opposed to his own opinions, he thinks he must sit down and write another article in opposition to it. This, as any one can see, would fill our periodicals with endless and needless controversy. Sensible readers are therefore in the habit of doing as the bee does—sip what nectar they can from every flower they find, while they pass over all the honeyless weeds in silence.

Still, once or twice in a life-time, such a man may see occasion for varying a little from so correct a rule; and somehow such a case has just happened to myself, who do not make any great pretensions to unnecessary carefulness. One thing, however, I think I can truly say, that, excepting as an editor, or when some position of my own was struck, I have never written a newspaper article in reply to another newspaper article in my now long life. When personally attacked, on the other hand, I have nearly always rewarded my assailant with a smile, but without a line in self-defense. Men, as well as things in general, are quite sure at some time to find their proper level; and the same is true of ideas, opinions, theories, principles, without any one person vexing his brains very much about them.

The exception I here refer to, is the spirited article published in the *HERALD* of May 16, written by Prof. Geo. H. Stone, which he entitled "Christian Champions;" for though the greater part of its statements are worthy of general endorsement, the apparent attempt to undervalue the great work of Wilford Hall known as "The Problem of Human Life," as I humbly think, is not to be commended; and I take up the pen to say a word or two in relation to this subject.

It is no part of my design, however, either to assail Prof. Stone, or to defend Dr. Hall. The one I could not do without giving up the boast of my whole life. The other I need not do, as Dr. Hall is abundantly able to take care of his own book. A work, indeed, that sells at the rate of about two large editions every month, and is now read by more than two hundred thousand of our leading citizens, sufficiently defends itself; and it is not to be put down, or put up by any newspaper articles which either Prof. Stone or myself could write, should we do nothing else while we remain on earth.

There is no doubt that Dr. Hall's work has been extravagantly eulogized. Prof. Stone gives several examples of such extravagance. I have seen and read many more. But these things should not disparage a meritorious production. Weak minds are always extravagant,

both in their praise and in their censure. Some men have put Shakespeare above the Bible; and I once heard a man professing scholarship pronounce Milton's "Paradise Lost" so dull a book that he could never read it. We are a world of "many men and many minds." Such opposite extravagances are consequently to be expected; and I can say for myself, that, when I read such trash, I am apt to give my chair a hitch and turn to something else.

In spite of all these things, however, there is a certain and real value in the marvelously popular work of Dr. Hall. As to his own theory of the universe—that *matter*, as a sort of substantial investiture of the being of God, is the *eternal substance* out of which the worlds were made—it is far from being new with him, or of any great account to anybody. He does not offer it, indeed, as anything better than a speculation of his busy brain. But in the iconoclastic portion of his argument—and it is nearly all iconoclastic—he stands without a peer, so far as my reading goes, among our modern physical philosophers; for, if he has given us no very important theory of his own, he has most certainly, in my poor judgment, utterly abolished all the skeptical, materialistic, atheistic schemes of the modern world, hitherto assailing Christianity from the side of physics; and had he been as happy in his metaphysical as in his physical argumentation, he would have left but little for the defense of our religion, as thus assaulted, to be desired.

Nor can I think as lightly of this sort of labor as does Prof. Stone. The truth of it is, the great effort of the wicked world, at the present time, against the whole Christian system, comes from the modern doctrine of evolution, which, as a physical theory, Dr. Hall's production completely overthrows; and in this way he has performed a service to Christianity, as it seems to me, beyond that of any other man of the present age. From Christians, therefore, such as Prof. Stone, he deserves encouragement, sympathy, honor, and applause, rather than contempt. Can the learned Professor mention any other person now living, who has done as much, or done anything, in this direction even half as well? I know of none. For the last twenty-one years this subject of evolution, for and against, has formed the bulk of my daily readings. I have three times visited Europe, and made long stays there in the best of its large libraries, to obtain better advantages for the study of the subject. Indeed, I know of no work upon it, of first-class value, in any of the four modern languages, on either side of the question, to which I have not given a careful and patient hearing; and among all the defenders of our faith against the antagonism of a so-called scientific mode of hostilities, I am compelled to acknowledge Dr. Wilford Hall as easily the chief.

Nor has the author of "The Problem" committed the blunder attributed to him by Prof. Stone, in making a needless answer to the old Greek philosophers, mentioned in the article, but never so much as named by Dr. Hall in his splendid work. Dr. Hall had no reason, certainly, for contending against any one of the list of "scoffing Greek philosophers" referred to by Prof. Stone; first, because the whole batch of these olden teachers of philosophy, so far as they infringed upon Christianity, had

been many times refuted by the early Christian fathers; secondly, because there was no call existing to repeat the good work so often and so completely done; and lastly, for the very sufficient reason that not a philosopher of the list given by Prof. Stone taught the doctrine which Dr. Hall condemns. "Doubtless," says our essayist, "Paul could (on their own ground) have refuted the *atomic theory* of Anaximander, Heraclites, Empedocles, and Lucretius;" but he showed his wisdom, the able Professor thinks, in preaching the simple gospel and saying nothing of these men. The same wisdom is also shown by Dr. Hall, who, in the work referred to by Prof. Stone, gives us not a word about them.

But let us inspect this list of philosophers a moment. Did they teach the "atomic theory" attributed to them by Prof. Stone? Only one person of the four; and he, Lucretius, was not a "philosopher," but a *poet*, besides being a *Roman* and not a "Greek." Anaximander was a Thalean, as strong a believer in the spirituality of man and the divinity of the great Creator as either Dr. Hall or Prof. Stone could wish. As to "Heraclites," there never was any such philosopher, either Greek or Roman; and if the writer meant Heraclitus, the weeping philosopher of Ephesus, he is then equally mistaken; for this philosopher was as constant an asserter of a divine and spiritual Creator of the universe as could have been desired by St. Paul himself. Then comes Empedocles, the third of the Professor's list, who, so far from being an atomist, in any proper sense, taught that God was the pervading Spirit of His creation, existing in both matter and mind, in animals and men; and we have left us, therefore, of the catalogue of Greek *philosophers*, who taught "the atomic theory," whom Paul was wise enough not to answer, only the Roman *bard*, Lucretius, the Latin translator and versifier of the atheistic doctrine of Epicurus, which has been most abundantly preached against, in all the leading pulpits of all the Christian nations, from the days of the apostolic fathers to the present moment. Not one of them has been wise enough, indeed, to practise the forbearance recommended by Prof. Stone!

How was it, on the other hand, that so learned a man as this critic of Dr. Hall could offer us a list of the Greek atomists—of those, in other words, who taught that there is nothing in the universe but *body* and *space*—that is, no soul in man, no spirit anywhere, and consequently no God—and not mention Leucippus and Democritus, who first delivered this atheistic doctrine to the Greeks? Had all the men he mentions been teachers of the genuine atomic theory, instead of being believers in spiritual natures, and holding to a sort of atomism only as the best of Christians may hold to it, the list would even then have been very faulty. But, in such an attempt at criticism, to catalogue the teachers of a system without naming its *author* its chief *defender*, and almost its sole *reliance* for a proper exposition of it, reminds one of the chronic joke of the play of Hamlet with the prince left out!

Still, the worst thing about this critical denunciation of Dr. Hall is its total misapprehension of the present relations of Christianity, of our divine religion, to real conditions of existing scientific thought. Dr. Hall knows but little, cares less, and says nothing, about this

list of dead and forgotten philosophers and poets of old Rome and Greece. He deals entirely with living issues and still existing men. He sees Christianity attacked, in the name of modern science, by such men as Darwin, Tyndall, Huxley, Haeckel, Helmholtz, Meyer, and others of the same school, and writes an able book, after twenty or thirty years of close reading and preparation, in its defense. We have ourselves beheld a company of two hundred of our leading men, with such a citizen as Wm. M. Evarts at their head, with some of the ablest of our college professors in attendance, and with such an orator as Henry Ward Beecher on his feet to give them an utterance such as no other American could give; and we have therein heard him say, in open eulogy of Herbert Spencer, their guest and glory, and the acknowledged interpreter of modern evolution—the form in which the most deadly infidelity now comes to strike our faith—that the doctrines of this enemy to Christianity "have for twenty years been his meat and drink." The leading pulpit of this great country has thus gone all over to the side of the rankest skepticism of modern times; and not less than fifty others of the superior class of pulpits have, in the same way, and in our age and country, bent down before this Dagon. Our colleges, too, are tottering. Harvard, of course, has swallowed evolution without a wink. Yale, led by Prof. Sumner, is rapidly coming to the same lean feast. Dr. McCosh is leading off in a similar way at Princeton. At the University of Michigan, Prof. Winchell, professedly a Methodist, has for years been writing books, lectures, essays, newspaper articles, in advocacy of the hateful doctrine. Then look at Joseph Cook, who crowds together the largest gatherings in Boston, the acknowledged centre of our American civilization, to hear him, a professed evolutionist, denounce another class of his own party because they differ from him in *one* opinion. In fighting Haeckel, he gives them Lotze; and his vast audiences seem to know no better than to follow and applaud him!

It is only a little time ago, moreover, that Dr. Edward Beecher declared, in an open congregational convention, that our existing Christian theology must be revised to meet the demands of modern science; and it is but a few days since that his more eloquent but less thoughtful brother, the Plymouth pulpit orator, said, in a very taking sermon, that most of the old dogmas of the Christian Church, such as the fall, the blood atonement, and future punishment, "must go," using for his purpose the set phrase of that bold and bad man, Dennis Kearney. Then look at the cases of Heber Newton, of Newman Smythe, of Rev. Mr. Thomas. Look at the new sect, calling itself the Liberal Religionists, most of whose preachers, like Mr. M. J. Savage of Boston, have immense congregations in the leading cities of this country; and think that this sect bases itself, not at all upon what Prof. Stone and myself would call revelation, but on the scientific absurdities of Darwin, Haeckel, and Herbert Spencer!

Time and space would both fail me in portraying the shaky condition of many, if not most, of our religious denominations at the present moment. A new epoch, a changed state of the public mind, has certainly begun. The pulpits and the pews share alike in the new spirit of the times. Church members by the

thousands, no less than their pastors, are reading the new order of so-called scientific publications, and they are daily putting questions to their pastors, *which must be answered, and that intelligently*, or they decline in their faith, or drop entirely from the fold. Many a sad tale of this sort could be told, had I the space. But I forbear. When pious, thinking, reading men are found drooping, like dying plants, there is always a cause for the sad decay; and in our age and country, this modern system of infidelity, calling itself scientific, is most apt to be the worm at the root, which eats away the substance of their strength. What multitudes of our once flourishing churches, particularly in our rural districts, where the people have time enough to acquire some smattering of these false but captivating notions, have tumbled into ruins, leaving nothing better than carelessness of religion, recklessness of life, or open departure from the faith, in place of their former freshness, thriftiness, and bloom.

If now in such a stage of things—or, indeed, in any possible state—a hitherto unknown man rises up, after thirty years of study and meditation, and delivers an honest blow at the enemy's head, does he deserve to be punished for it? It matters not, in fact, whether the blow he gives be a strong blow, or a weak one, or scarcely any blow at all, his good intentions should shield him from all assaults. "But he is *over-praised*." Well, suppose he is. Excessive laudation of another man never stirs the jealousy of a really great, pure, loving, generous Christian's heart. Besides, Dr. Hall is also *under-praised*. He has a world of enemies. But his enemies are of the infidel classes of this country. He has, therefore, the greater reason to expect that all Christians will be his friends; and I sincerely trust that Prof. Stone, when he comes to think the matter over, will finally contribute his fine talents to Dr. Hall's support, and be numbered among his host.

As to preaching science in our pulpits, I most cordially agree for the most part with Prof. Stone; but if this modern skepticism is to be met and overcome, as its prototype was by the early fathers of the church, somebody must learn how to do it; and, think of it as we may, our clergymen will be compelled by their relations to Christianity, to their respective communities, and to the social state, to take upon themselves the leading burden of the work. Let every one of them beware, however, to say as little as possible on the subject till he has studied books enough, as well as meditated years enough, to understand it. Otherwise, he will do more harm than good. Gladly would I indulge the hope that, when fully ripe for it, so excellent a man as Prof. George H. Stone shall make himself, in my understanding of the term, the true "Christian champion" of his State, for the cause needs the help of every man, who, with his intelligence, can either write or speak.

THE MOON-DIFFICULTY MET.

(REPLY TO DR. HALL'S OBJECTIONS.)

BY B. T. KAVANAUGH M.D., D.D.

In the June number of *The Microcosm*, the Editor has swept over the ground occupied by

my series of articles of nearly twelve months, and here and there raised objections involving a great variety of points not accidentally made out, to which he expects me to reply in full in one article to be published in this paper, and yet this article must not occupy over two or three columns. Assuming as he seems to do, that I would become so much entangled with the difficulties he suggests, that I would be supposed to relinquish the whole subject in hopeless despair of success in maintaining the ground deliberately taken in the foregoing articles, he proposes out of the kindness of his heart, in this supposed dilemma, a way of escape by which he says, I "may safely, honorably and publicly abandon the electric theory as the mistaken motor power of the solar system."

While we can assure the learned Doctor that we duly appreciate the tender regard he expresses for our safety, I feel bound by all that is sacred to truth and righteousness, to decline his gracious offer, and if time and circumstances permit, I propose to render solid and substantial reasons for so doing. But, lest his solicitude for my welfare should give him pain, I am glad to assure him that I feel perfectly secure and happy in what he may regard as a delusion, and I even cherish the fond hope that in the future, he may realize the insecurity of the sinking ship of Universal Gravitation on which he is sailing; and in return for his well-meant kindness, as I have no use for his proposed door of escape, I will generously leave it open, that before his fabric utterly fails him, he may launch the life-boat and pull for the grand staunch-ship of the Electric Philosophy, so well ballasted and rigged for a safe and successful voyage, that he may make safe his retreat according to that favorite old song with slight "variations"

"While the lamp holds out to burn,"

The shipwrecked sailor "may return."

But to be serious for the present, passing by minor questions too numerous to be mentioned here in detail, I must comply with the earnest request of the Editor to deal with the moon question on which he has so eagerly seized as the point on which I am to be immolated, in the close of this controversy. It was always regarded a virtue in a martyr, to walk up to the fatal stake with a courage and confidence corresponding to the magnitude of his cause. Thus, the victim is before you. Before I die, however, hear me for my cause a word or two.

In a former article I did inadvertently and unadvisedly say that the attraction of gravitation "*may* extend" to the moon, of which casual remark, I do now repent, and ask pardon, for upon reverting in my extremity to Nature's own great treasury of Truth, which has never failed me in any emergency, I find clearly delineated in the mysterious machinery of the electric system, great and wise provisions precisely adapted to the regulation and control of all satellites in their orbits.

But, before I develop and apply this effective law, I must revert to the absolute necessity of clearing away the rubbish thrown by the doctrines of gravitationists in the pathway of the moon around the earth. Heterogeneous as are their views, no two agreeing as to the push and pull power of the moon and earth respectively, we think we can relieve them of their embarrassments by sweeping away the

entire cobweb system in which they are entangled, and substitute something more rational and effective.

All astronomic philosophers agree that the gravitation theory calls for a *vacuum* in which the celestial bodies must revolve where no force or external agency can by possibility intrude to impede their progress. That there is no such vacuum should be admitted by all. "Nature abhors a vacuum." Now we understand Dr. Hall to teach the "*substantiality*" of gravitation, and if this be true does he not introduce into this vacuum a foreign substance which in drawing the body by constant force from the straight line of its direction into a curve, must of necessity greatly retard and interrupt its motion? The acceptance of this doctrine above, would prove the vacuum theory untenable. Apart from this necessary intrusion on the part of gravitationists doing violence to their own theory, it must be acknowledged that the three great elements of light, heat, and electricity proceeding from the sun are known to penetrate every conceivable point in the realms of space as alluded to, and pointed out, in my series of articles, where, according to our theory, they are made to subserve and promote the action of every planetary body.

The fallacious idea of universal gravitation whose only province is to attract moving bodies to a common centre, can perform no part of the functions ascribed to electric currents in their diversified forms of action. Indeed the whole force of gravity in movements of machinery is, to interpose resistance by friction in the ponderous bodies composing the massive machinery, and hence its province is to retard or stop motion. Therefore, as a motor power, as applied to the moon or any other heavenly body, it is wholly incompetent to perform the functions necessary to perpetuate its action, and is, therefore, rejected. A self-adjusting force is what the case calls for.

To give an example in point we refer the reader to No. IV. of my published series, in which (as this is a moon test) the moon's action on the tides is alluded to. In this it was shown that when the dark or negative side of the moon is presented to the earth, as at new moon, it attracted the waters of the ocean in a positively electric condition, while at the same time it repelled those in a negatively electric state to the opposite side of the earth, thereby producing antipodal tides of equal magnitude, with regular polarity between them, when it is known that there was neither sun nor moon on the opposite side to exert any gravitating influence whatever.

In a series of Lectures delivered before the Faculty and students of many of the Western colleges, I called upon the advocates of gravitation, in every instance, to explain to me on the principles of gravitation how the second or antipodal tide is caused. Up to this time no one has attempted it, and I now extend this challenge to the whole fraternity, to give a satisfactory explanation of this phenomenon on other than electric principles. When my article, No. IV., appeared in the *Micocosm*, the editor confessed that the doctrines of gravitation must be modified before a satisfactory explanation could be given.

Here I plant myself: and in the language of John Adams, when the Declaration of Independence was adopted, and his life was supposed to be forfeited, he declared: "Live or die,

sink or swim, survive or perish, I stand by this declaration," so I here declare while God in Nature presents to my view, the great cardinal truths of the sublime system of philosophy, found to exist in the Electric Theory of Astronomy, that I will in the most solemn manner, consecrate my feeble powers to its maintenance and support regardless of consequences.

Now that we have seen that Gravitation must utterly fail to regulate or control the revolutions of the moon in its orbit, I now offer the more rational and philosophic electric process, by which the moon is not only sustained in its motion, but held at its proper distance from the earth.

Under the lights of investigation, made by Faraday, the great English chemist, a pupil of Sir Humphrey Davy, and of Ampere the French philosopher, it was found that heavy currents of electricity were produced in and around each primary planet, apparently to subserve the local demands of the planets themselves. The theory, in full, then, is this: Currents of electricity originating in the action of the sun upon the earth, superinduce strong electric currents through the body of the earth, passing from East to West. These subterranean conduction currents of negative electricity, give rise on the principle of induction to convective currents of positive electricity in the atmosphere moving from West to East, according to the law of Ampere, that parallel current of electricity passing in opposite directions, repel each other.

This belt or current, passes entirely around the earth forming one of a concentric series of currents, in one of which the moon's pathway lies, and is carried forward by its agency.

This idea, is both suggested and sustained by the disposition and regulation of the satellites belonging to the planet Saturn, around which the concentric rings are made visible by luminous gases or substances suspended in them. So also in the case of the planet Jupiter, where there are fewer bands, and a less number of satellites. I think we may rationally conclude by analogy, that every planet attended by a satellite, possesses like electric bands, belts or currents, and hence the earth has such, though they may not be visible to an observer, on its own surface. Further to sustain this doctrine of electric currents in and around the earth, we extract the following from that valuable work, "A New System of Meteorology" by Prof. Tice of St. Louis, than whom, there is not a more profound electrician living. Prof. Tice says:—

"The electric currents that circulate through the earth from East to West, are conduction currents, because the Earth is continuous matter. No current can flow in any direction without inducing currents in adjacent matter in the opposite direction. Consequently the electro-negative currents that circulate from East to West through the Earth must induce parallel electro-positive currents in the Atmosphere flowing in the opposite direction. Since the Atmosphere is not continuous but disjointed matter, these are not conduction but convection currents, that is, the electricity is conveyed by the gaseous atoms of the Atmosphere moving from West to East.

"The conduction current in the earth and the convection current in the Atmosphere being two parallel currents of electricity flowing in opposite directions, must, according to

the electric law discovered by Ampere, repel each other. This mutual repulsion between the currents in the Earth and those on the atmosphere accounts for the flocks of floating ice crystals constituting very high cirri clouds often encountered and observed by aeronauts. It also accounts for the flocks of dust and the pollen of pines that float along at high altitudes in the atmosphere as smoothly as if they were on the surface of a river. *It does more. It accounts for the mutual repulsion between the Sun and planets and between planet and planet.*" (The italics are our own).

Again, Prof. Tice says: "The currents in the Sun must act inductively upon the Earth—in fact upon all planets—and must evoke electric currents in them flowing in the opposite direction. It can be demonstrated that this electric action of the Sun produces the axial rotation of the planets. But this would be foreign to our purpose since we are dealing with Meteorological facts and phenomena, and not with Astronomical ones, except so far as to develop and demonstrate causes and laws that underlie both Meteorological and Astronomical Science." (See Tice's "New System of Meteorology," pp. 109 and 110.)

It will be seen from the above that the motion of the moon is really from West to East, corresponding with the directions of these currents, although its apparent motion is from East to West on account of the revolution of the Earth on its axis.

Thus every part of the theory is in harmony with itself as far as now discovered, but it is well known that this science is yet in its infancy.

I here acknowledge my obligations to Dr. Wilford for *insisting* upon a clear utterance of my doctrines in regard to the moon, though it has cost me much reflection and research, when my time was limited. The result is highly satisfactory to myself, and I think will prove equally profitable to the readers of the *Microcosm*, as it gives completeness to the outline of the theory.

The length this article has already attained, will preclude my answering in detail the many objections not here noticed.

It is, however, due to myself to state that our friend Wilford is mistaken as to my careless use of scientific terms. On the contrary, feeling the necessity of accuracy, I took the pains in No. IX. of my series (see April *Microcosm*) to distinctly state the meanings I attached to the words "Electricity," "Electro-magnetism," etc., and although these differed in some cases from their generally received definitions, I found myself compelled in advancing new ideas to either make new words, or attach new significance to those already in use.

MT. STERLING, KY.

THE LAWS OF MIND,—NO. 5.

BY REV. J. W. ROBERTS.

Again has the writer's attention been directed to the declarations of persons who set up some kind of an indefinable claim concerning the properties of matter at variance with its fundamental principle of *inertia*. It is gratifying to know that these papers are attracting the close attention of earnest, intelligent and thoughtful readers, and that they are

looking to them for light, and help and information on the subject under consideration. Let not expectation reach too high, or deep, or wide; for there is a limit to all human investigation, and that limit is reached when the boundary line which separates the finite from the infinite is touched. Into the unknown beyond no mortal eye hath pierced, no fleshly footstep left its impress by the way. It should be borne in mind also, that the design in this series of articles has reference to the mental rather than the physical domain of research, and that the latter has only come under review in so far as it seemed necessary to lay a sure foundation for the superstructure whose capstone should be laid in the realm of mind. Anything approaching an exhaustive treatment of the laws of the physical universe is foreign to the present purpose, and cannot enter into the method and make-up of the work now in hand.

But if the reader will carefully study and comprehend the axioms and fundamental principles laid down in the preceding numbers of this series, he will not be easily led astray by vain sophistries and theoretic dreams, which have no place in the things that really exist and constitute the grand and expansive universe of which the earth is but a meagre part. However, to meet the wishes of earnest inquirers after truth, this paper will be devoted, in the main, to the consideration of a few points which relate principally to material things.

One writer tells us that Herbert Spencer teaches that "matter is but a symbol of the unknown." And what is that unknown? If matter is but its symbol then is it greater than matter, for that which is symbolized is always greater than the symbol. Has Spencer, or any of his inferior followers ever defined this mysterious unknown that they make the scapegoat of their ignorance? Nay, verily. No plummet of theirs has ever sounded the infinite depths which environ and belong to that incomprehensible Unknown. The man of profound thought instinctively uncovers his head as he approaches the hiding-place of the power of that sublime Presence. Only small minds rush with heedless steps where "angels bashful look."

Again, we are told that Prof. John Tyndall says: "Matter is essentially mystical and transcendental." And, pray, what is this but an open confession on the part of Mr. Tyndall that he don't know anything about matter, and so retreats with an effort to cover his lack of knowledge in the dust of high-sounding words which have no meaning, and as little significance outside of the use into which they are pressed for the occasion? Possibly he may wish to "tickle the ears of fools," and create an impression that he stands by some "gate ajar," through the aperture of which he has gazed upon mystic wonders that he is about to reveal; but *never will*.

Another writer says: "Absolutely inert matter would be no matter. For every property of matter, we know is a product of energy." Well, what is that energy? As matter is produced by it, it is matter's superior, matter's creator; for the producer is always greater than the thing produced. Why does not the writer have the logical acumen to see the necessity of explaining what his boasted energy is? Does he not perceive the gross absurdity of his position? He is trying by such shallow devices

as this, to rule out of existence a Creative Power, and yet his very energy is but another name for that of God; and a poor substitute. The same writer adds: "Inert matter would be matter without color, light, heat, electricity, gravity, chemical action, or form." Why did he not go a step further and tell us how matter gave itself these qualities he names? It is exactly at this point that light is needed, if his theory is anything but a hollow sham. If he, or any other individual, will explain the phenomena of matter on any other hypothesis than that of a creative First Cause, he will do what rationalism has vainly tried to accomplish for ages and most signally failed. For thousands of years men of renown have grappled with this vast problem; and to-day it is as far from solution as when the priests of Egypt, the Magi of the East and the philosophers of Greece and Rome wrestled with it in the dim ages of antiquity. It is easy to talk. Assertions are but words and "words are wind." Talk is cheap, but truth is power.

No scientist or philosopher who has a reputation worth creating or preserving will have the temerity to deny the inertia of matter; and until some one whose opinions are entitled to weight, or whose logic commends itself to consideration, shall deny this *inherent* and *basilar* property of matter, it is a waste of time to chase after the vagaries of those who do not know of what they speak. Nature is true to herself, and one fact clearly established, no other truth in all her wide domain will be found to contradict or be out of harmony with that one; for she is not at war with herself, nor "speaking lies to deceive" those who knock at her door seeking knowledge.

If any man can develop in matter any principle of life or activity, the production of which will overcome any portion of its inertia and quicken to any degree its dead helplessness into inherent activity, he will make a fortune by the side of which the wealth of the Rothschilds and the Vanderbilts will sink into insignificance! What a boon to mechanics would such helpfulness be! How the heavy burdens would be lifted from weary shoulders! What life and energy would be infused into material things and their uses, and what ease would come to labor, what rest to weariness! This from one standpoint.

But the stability of the universe, as well as every structure reared by man, imperatively demand this very property of *inertia* in matter. Without it there would be endless fluctuations and mutations, and no one could tell what a day would bring forth, or whether there would be another day, or the present one last an hour longer. No calculations could be based upon the return of the seasons in their appointed time, of day or night, or the cycles of the spheres. Invest matter with qualities that would destroy or modify its inertia as an inherent attribute, and let it become wayward, like man or beast, or bird, or creeping thing, and what chaotic medley and crash of worlds would take the place of an orderly universe! No, inertia, without a shade of mitigation, is absolutely an essential property of matter. Bear in mind, as previously stated, that no other fact in nature will or can conflict with this one.

There are but two forces in the physical world which men can manipulate. These are mechanics and chemistry. All investigation of mate-

rial things must be conducted on one or the other of these lines. All else is speculation, hypothetical or otherwise. Mathematics are employed to assist in the demonstration of problems. What mechanic or chemist has ever entered the secret arcana of Nature and brought from her great throbbing bosom the secrets which lie buried there? The tendency of investigators is to reach out after the unattainable and leave the things that lie closer at hand unsolved.

The most elaborate research yet bestowed upon the subject has failed to show why the same air, earth, moisture and sunshine produce variety in the texture, fibre and character of plants and trees, or the various colors and shades of color in flowers and leaves of the vegetable kingdom, all of which grow side by side. Why is one flower red, another blue, yellow, violet, pink, purple, etc.? The wisest chemist and most laborious philosopher are utterly unable to account for this apparently simple operation of natural laws, and are as dumb as the speechless rock in presence of so common and yet so profound a mystery. Leaving these everyday problems unsolved, and sealed, apparently forever, in the great book of Nature, these men—or some of them—stretch forth their puny hands and strive to lay hold upon the pillars which uphold the fabric of universal Nature, and solve the profounder mystery which embraces all the lesser ones. They grow wise in speculation, and boast of wonderful discoveries never made, and grand victories never achieved. It is easy and comparatively safe to revel in the regions where mechanics are barred out, and the chemist has no place, so that the wildest theories may have full play, and only logic can expose them; and to logic sophistries can be opposed. Why not master the things nearest to hand before entering the wider domain? Why leave the tangible for the intangible? Ah, it is much easier to speculate and theorize than it is to dig out truth by dint of persistent labor.

As already stated it was foreign to the original design in writing these papers to dwell so long in the region of the physical; and it has only been the appeals of those who appear to take more than ordinary interest in the theme, that have caused a variation from the line of action at first proposed; and now that we are here, it may not be inappropriate to state a few broad principles which underlie the very structure of things, and should enter into the calculations of every scientific investigator, as they do into the more philosophical and practical concerns of common life.

The one great law of Nature which permeates everything is this: *There is no improvement anywhere, except that which is directed by a higher intelligence than is possessed by the entity acted upon.*

Water seeks its level and air its equilibrium; and these are types of Nature in all her multifarious operations. Her laws are immutable, and she trifles with no element or creature in all her boundless empire. Push water by mechanical force above or below its normal condition and immediately the pressure is removed it returns to its primal state. Make a vacuum by any process, and the moment the producing cause is removed equilibrium of the air is restored. So of heat and cold; they commingle until a uniform temperature is attained. This principle of equalization, of

preservation in natural condition, runs through all the ramifications of nature, and forever makes it necessary that "like shall produce like," and no intermingling of substances, either animate or inanimate, shall work confusion or uncertainty. The positive necessity for this inexorable law will be obvious at a glance. Without it the husbandman would not know how, or when, or what to plant; nor the stockman what his herds would bring forth. The idea of improvement without the aid of applied intelligence is, therefore, a chimera. All theories which depend upon any supposed condition of things or action of forces in contravention of this universal law must of necessity be erroneous. Prof. Haeckel states this law in another form when he says:

"There appears, indeed, to be a limit given to the adaptability of every organism, by the type of its tribe or phylum. * * * * * However, within this hereditary *primary* form, within this *inalienable type*, the degree of adaptability is unlimited."—*History of Creation*, vol. 1., page 250.

This statement is made in the interest of Evolution, and is not a happy form of words, but the substance is there. There is no getting out of or away from the order and boundaries which Nature has set. Within these boundaries there is pleasing variety, but beyond them no creature or thing can pass, from an atom to a world. It follows as an unavoidable consequence of this eternal and immutable law that in the material universe there can be no such thing as "natural selection" in the sense understood by evolutionists, whereby one order or species can transmit to another any improvement. This being an *impossibility*, the whole theory of Evolution breaks down in the hands of its friends, and must perish.

As stated once or more in these papers the ability to create an atom carries with it the ability to create a world. Adding the least thing to what did not previously exist is to *create* that thing, whether small or great *out of nothing*; and as Evolution is made up, from first to last, of "accumulations" of properties which previously had no existence, it is but a *series of new creations of properties and powers which are brought forth by "slow processes" in a miraculous manner*. There is no escape from this sweeping conclusion; for Evolution claims to develop everything from inanimate matter up to man, and every step, from the dawn of life to the unfolding of intellectual powers and moral accountability, *produces something that did not previously exist and, therefore, must be created*. It is the most monstrous system of credulity ever presented for the consideration of intelligent beings!

Illustrations of the law governing change or improvement as given above are found all around us. Grains, fruits, flowers, vegetables, etc., are improved *only* by the intelligent care and culture of man. The finest flowers known to the floriculturist will degenerate to the level from which they were originally taken, unless constantly cared for and guarded from this tendency. The same is true of fruits and vegetables. The utmost care is necessary to preserve their excellence and purity. So of "blooded" stock, fowls, birds. All degenerate as soon as intelligent guidance is removed. These are facts universally known, and they demolish the theory of the "survival of the

fittest" as completely as it is possible to overthrow a fallacy.

The theme widens and deepens but a halt must be called; for this article is already drawn out to the limit; and leaving the territory of the physical, so pregnant with stores of knowledge and truth, we must enter more directly into the intellectual kingdom.

NOTE.—Those who wish to pursue a line of thought connected with materiality, will find some excellent suggestions and "logical reasoning in the papers of Isaac Hoffer, Esq., Elder C. S. Towne, and other contributors to *The Microcosm*. The writer must leave this field of investigation for the one which explicitly belongs to this series of articles.

THE WATERS ABOVE THE FIRMAMENT, OR THE EARTH'S ANNU-LAR SYSTEM.

BY PROF. J. N. VAIL.

In my former communication to the MICROCOSM I gave in brief a part of the scientific evidence contained in the unpublished "Waters Above the Firmament," showing the necessity of annular formation in the evolution of the earth from its igneous condition. In this paper I will again condense from the same MSS. to rivet that evidence, if need be, upon the mind of the reader, so that he must either admit the truthfulness of the theory or deny the supremacy of physical law.

There is a kind of evidence, the force and integrity of which no sane person can doubt. A writer of history informed mankind that "God created great whales." This simple declaration contains indisputable evidence that the author knew that such animals existed in the seas; for, if none such existed the sentence would never have been penned. The announcement that "God made two great lights, * * and the stars also," would never have been made if the narrator had not *known* that they *existed*.

It is this unassailable evidence, found in Genesis, that settles the annular theory deeply and firmly upon its eternal foundation. "*And God made the firmament, and divided the waters that were under the firmament from the waters which were above the firmament; and it was so.*" By the intrinsic nature of the evidence, inseparably linked with this simple declaration, we are forced to admit that this sentence would not have been penned if the ancient inhabitants of the earth had not been cognizant of the fact. That there was a great fund of waters exterior to the Hebrew *Rakia*—our atmosphere. To doubt this would be to place ourselves in the situation of one who should doubt the existence of the heavens and the earth, because of the declaration: "In the beginning God created the heavens and the earth." Both expressions contain the same incontestable evidence that man was familiar with the objects made or created. Now, so far as the force of evidence is concerned, I care not whether the reader will cast aside his prejudices or not. The cold logic of facts is the same to the theist, atheist, or infidel. I care not whether Genesis was penned by an Adamite, a Moses, a Voltaire, or a Paine, the conclusion must be the same: that antediluvian

man *knew* there were *waters above the firmament*, as he knew there were "seas" on the earth. "And it *was so*." And I say *if it was so*, the question is *settled* at once and forever by the imperious decision of inexorable law, that those waters, in whatever condition they existed, *revolved* about the earth as *rings or belts*.

Thus, on the very threshold of this investigation, the oldest and most reliable history establishes with remarkable accuracy the very condition, absolutely necessitated by the evolution of the earth from its primitive state.

Science tells us a vast fund of vapors revolved for unknown time about the earth, and we are assured by the first chapter of Genesis that some portions of those waters continued to revolve about the earth after man came upon the scene. But lest the reader should think I place undue force upon the Scriptural evidences of upper water I will fortify it with any kind of collateral evidence he wishes. He surely will have no hesitancy in acknowledging this to be fair. The most confirmed atheist or infidel gives ready credit to the fact that—this world was at one time, after man's advent upon it, visited by a terrific cataclysm of waters. The tradition of almost every tribe of men and nationality under heaven forces this admission from all eminent men of science. We find the account of it in Genesis, given in connection with transpiring phenomena, that *impel* admission. It is there represented as a terrific rain of forty days and forty nights, whose down-rush desolated the world, "The old world being overflowed with water, *perished*." *Did that rain fall from the clouds?* I stand under the protecting wing of *Law* and proclaim an emphatic "No." Where is the man that will venture to say that it did? Where is the philosopher that will for one moment entertain the monstrous absurdity and impossibility? No man of sense will claim that it came from the clouds, except as a stupendous miracle, by the *fraction of law*. Whence, then, *did it come?* If it did not come from the clouds, it came from *beyond* them! *And if it came from a source beyond the clouds, it came from revolving waters or vapors!* There is no other possible conclusion. To the philosophic mind, then, the Noachian deluge is proof *in itself* of the truth of the annular theory, or the "waters above the firmament."

But the chronic doubter, not being disposed to philosophize, may urge the possibility of a deluge from the overflow of the oceans. *Very true*; but this admission destroys the *last hope*. For if this be the source of the Noachian deluge, as that source still remains, it is liable to occur again at any time. But the Almighty said it would never happen again, "so long as the earth lasts." Then it is *impossible* for it to recur. Therefore the source of the flood of Noah was "broken up," and does not *now* exist as it did *before* the flood, and cannot be the ocean. When Jehovah said: "Neither shall there any more be a flood to destroy the earth." He located its *source* and *cause* in the "Great Deep" above, since it could not philosophically be located elsewhere. That source was broken up *at the time* of the flood, for it existed before it happened and did not exist after. Unless this be true, the promise of the Almighty means nothing at all! But "His word endureth forever," and His promise cannot fail. Now, is it possible for the philosophic mind to imagine any source of deluges that did *once* exist

and does not *now*, except the Great Deep above, which we *know* did exist, and which does not now exist. That source is broken up, and no other imaginable source *can* be broken up. This the microscopic test of law affirms. Now, it is evident when that great fund of upper vapors existed, the *rainbow* could not come into view. It is also evident that no other intercepting medium than those vapors could have prevented its formation. Then if antediluvian man saw not the rainbow, such a fund of vapors hindered its formation. Also, if it came into view for the first time immediately after the deluge, it is proof *positive* that the intercepting body of vapors *fell at that time*. Thus every step we take fastens the conviction upon us that the deluge was the fall of the last remnant of the waters above the firmament. But the evidence strengthens as we proceed. Not only did the Almighty assure mankind that another deluge could not occur, and thereby establish its exterior source beyond a question, but, as if to make that assurance doubly sure, he reiterates that the deluge came from beyond the clouds, by proclaiming the rainbow a sign of security. Now, any man ought to be able to see that, as a sign of security it has *no meaning at all*, unless the flood had the source I have here claimed. Every time the bow comes into view, it proclaims that there are no more waters above the firmament—that the grand source of deluges is broken up. Here, then, we are simply impelled to admit that the flood *did not come from the oceans*, for the rainbow cannot secure the earth, from their influx. In fact, it can secure the world from *no source* of deluges save the Great Deep above. Now the bow is an *infallible* sign of security, for an infallible God made and announced it a sign. It seems as though the Ruler of Heaven has taken especial pains to *point out* the earth's annular system to the view of man, presenting with it such a fund of evidence that it seems impossible not to understand it. The most amazing thing is the fact that man—a boasting philosopher—has not long ago wrought it out.

Gentle reader, I regret to thus so briefly treat this grand and exhaustless subject. We have established our theory upon an immutable foundation, and yet we have *only begun* to examine the evidence. As we proceed, the same kind of witnesses crowd in to testify. The door swings open to a new, prolific and most fascinating field of thought. The whole Edenic world opens its history, transformed into a grand panoramic view, and its most mysterious phase is solved by the test of *Law*. A marvellous flood of light falls back upon the past, and reveals the ineffable harmony of revelation and science. The very foundation stone of infidelity is torn up and no place left to rebuild it.

Let me ask the reader to apply the test of philosophy to the evidences I have here produced, and change its bearing if he can. If he be of a philosophic turn he may throw aside *all I have written*, and then take up the first eight chapters of Genesis and prove the truth of the annular theory by the "little but mighty" links of evidence there found, and which I have not *touched* upon. If he have a penetrating eye he will then find the *master link of evidence* which I have purposely reserved for the day of emergency.

I trust it will now be readily admitted that the annular theory is essentially true, and that

we are now prepared to examine into the geological column for new and astounding developments. Let us march to the front.

BARNEVILLE, OHIO.

◆◆◆◆◆ SKEPTICAL TENDENCIES OF MODERN SCIENCE.

BY JAMES W. LOWBER, M. A., PH. D.

NUMBER 1.

WE hear much about Modern Scientific Culture superceding Christianity; and the Christian religion is supposed by some, to conflict with the highest scientific culture. We do not believe a word of this prattle; but on the contrary, we are fully convinced that Christianity is in perfect harmony with the highest culture.

What do we mean by culture? The word culture is derived from the Latin *cultura*; and it denotes the cultivation of all the faculties of the human mind. The Romans sometimes used the word *humanitas*, and the Greeks *paideia*, to denote the same thing. We use the word culture, very much in the same sense in which the Germans use the word *bildung*. It is something of an exotic in our language, but the best we can do. We will express its full meaning thus: The drawing out what is potentially in man; the training of all his energies to the highest pitch, and the directing of them to their proper ends.

Prof. Huxley has written some good and very suggestive things on the Science of Education, and I have taken great pleasure in reading his writings on that subject; but I do not believe that he comprehends in his system of education, the full meaning of the word culture. He is a specialist in a department of physical science; and makes it the centre of the circle in all his writings on the subject of culture. The spiritual part of man's nature, he almost entirely neglects. It is an established fact, and entirely scientific, that man has a religious faculty; and this faculty is the highest element in his nature. We believe it should be the centre of the circle, in every system of education. In fact, there can be no true culture, where the religious part of man's nature is neglected.

Christianity, which is enveloped in the Old Testament, and developed in the New, is the highest of the sciences. It not only harmonizes with the highest culture, but it comprehends such culture: first, because it is the culture of man's highest capacity; secondly, because it must acknowledge all the other capacities of man's nature as given by God, and important for cultivation to the highest extent. When Christianity fully accomplishes its mission, culture will result in the perfection of humanity. Narrowness is the principal cause of the skeptical tendency of modern science. Specialists in certain departments, imagine that all knowledge is comprehended in their limited circle; and from it, they draw unnecessary inferences. What they need is a broader culture, more light, and their skepticism will vanish like the morning mist before the rising sun.

When a scientist makes a discovery, which he supposes to contradict Christianity, all he has to do is simply to wait a few years, and

science itself will completely explode his baseless assumption. In 1868 Professor Huxley announced to the world, the discovery at the bottom of the sea, of a jelly-like substance representing masses of protoplasm, to which he gave the scientific name of *Bathybius*. In 1872, Strauss wrote the "Old Faith and the New," and he used *Bathybius* as the means of bridging the chasm between the organic and inorganic world. He admitted that unless this could be done there was no possibility of getting rid of the aid of a miracle. *Bathybius* has failed, so, Strauss himself being witness, a miracle has occurred, and science thus far is in harmony with the Scriptures. In 1875, the ship *Challenger*, engaged in deep sea soundings, discovered *Bathybius* to be nothing but sulphate of lime, and when it dissolves, it chrysalizes as gypsum. The most ingenious attempt of modern times to account for the origin of life thus fails, and the Biblical account stands as firm as the rock of Gibraltar.

LANCASTER, KY.

◆◆◆◆◆ A PROBLEM ABOUT COLOR.

BY PROF. R. D. MILLER.

Editor "MICROCOSM."

Dear Sir:—I purchased a copy of the "Problem," when first issued, read it with great interest, and was led to renounce many theories that I had taught for years. Have read every copy of the "Microcosm" and have come to regard it as a visitor that I cannot do without. I feel that in giving your book and paper to the reading public, you have become a benefactor to the race, and that your labors are destined to produce a revolution in the whole field of Science.

Excuse me for propounding the following question, requesting of you, or your correspondents an answer, that is, if you think it worthy of an answer.

Our philosophy teaches us that light is a compound, made up of the seven prismatic colors. Of these the red is refracted the least because the rays have the greatest momentum; and so on in their order, according to their momentum. The proportion of these rays in pure solar light is as follows: in 360 parts, red is 45, orange 27, yellow 48, green 60, blue 60, indigo 40, and violet 80.

In explaining the colors of various objects it is claimed that the peculiar chemical properties of objects cause them to absorb certain rays, and reflect others; as the scarlet geranium absorbs all the rays except the scarlet, and these being reflected, give the color.

If this be true, how is it that when the seven colors are thrown on any colored object in a darkened room, that the object appears the color of the ray falling on it. In other words, if the theory be correct how is it that when they are all thrown on a scarlet object that all the colors are brightly visible? This is a known fact. Does it, or does it not contradict the theory?

PETERSBURG, ILL.

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In spite of all we can do the crowd of articles, from our contributors, forces us to leave many good ones over. They will all appear in time.

WILFORD'S MICROCOSM.

23 Park Row, New York, Sept., 1883.

A. WILFORD HALL, Ph.D. Editor and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourself responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But generally, we hope and aim to be consistent.

EDITOR.

OUR CONTROVERSIES.

We could sincerely wish that our editorial life were relieved of the present necessity for the incessant controversy on critical scientific and philosophical questions, which unavoidably stands out so prominently in the editorial department of this Magazine. We would be glad to devote more of our time to the smoother line of discussion in the religio-philosophical field. But this seems impossible at the present stage of the contest over substantialism. The quarryman who blasts out the crude material, and wrenches the rough blocks of stone from their granite beds, seems to be no less needed than the shapers and polishers, who with chisels, and mallets, and rubbing devices, form and smooth the blocks for their appropriate places in the stately edifice which they are designed to make. It has been assigned to us, as it would seem, to do this quarrying and blasting, and to our little army of contributors to do the shaping and polishing of the rough material. Possibly we may be putting in more or larger blasts than required to bring out the necessary quantity of crude material. But we are in a hurry to see the building go up before we go hence, and we prefer that no blast shall prove abortive even if we have to employ an apparently unnecessary quantity of dynamite to produce it.

Dropping metaphor we regard, as the first essential in the revolutionary work in which we are engaged, that the foundation of our substantial philosophy shall be made strong and sure in the central fact of the entitative or substantial nature of all force. Without this fundamental work well done all our mere philosophizing or theorizing about the substantial nature of the soul, mind, life, or spirit, as a basis for a future conscious state of existence, is mere waste of words, especially when expended upon a thoughtful scientific skeptic. Till you have fastened indelibly upon the conviction of such a thinker that he has a real entity and personality within him, not constituted of material particles, but at the same time as truly substantial and real as are his nerves, muscles, blood-corpuscles, bioplasts, and even bones, you may as well talk to him about the ghosts and hobgoblins of a deserted grave yard, so far as making any convincing or lasting impression, as to talk about his so-called "soul" living personally and consciously after the body dies.

As proof of this we notice how ineffectual are the eloquent appeals of pulpit orators upon such thinkers while discussing the average theological tenets concerning a future state of existence, and how flat the average arguments

for immortality fall upon them, even the best that can be culled from Butler's analogy, and like standard sources. Up to within the past three or four years clergymen generally, and theological writers in particular, have wholly overlooked the true method of approaching these scientific skeptics, many of whom are as honest and as sincerely seeking for light concerning the dark future, and are even as free from bigotry or undue mental prejudice as is the average professed Christian. These doubting, but anxious minds have got to be approached in some other way than by emotional appeals, and fervid exhortations, though all this is well enough to arouse action after the intellect has become fully convinced. Herein is where pulpit orators have heretofore labored under a mistake, by not having first grasped the elementary tactics needed to be studied and adopted in a successful warfare against such enemies to religion. They are beginning, however, to see that the skeptical mind of the honest scientific thinker and investigator must first of all be routed from this strong hold of materialism before the true light can strike him, and then he must be made to see by solid reasons that he is a dual being composed of a double personality, and that both halves of his nature are real, entitative existences. To do this effectually he must be forced through the elementary curriculum of the natural forces as thoroughly as a child must first be led through the spelling book and the elementary readers before entering the higher branches of common literature. The teacher of a true and effective religious philosophy must himself learn to comprehend the first principles of a true and rational natural philosophy. And we assert that the essential and foundation element of all true natural philosophy is the underlying truth of science that every force of Nature is as really substantial as are the trees, rocks, and animals of the material realm. Until the minister of religion can thoroughly grasp this elementary truth of natural philosophy, that everything in Nature that exists as the basis of a positive mental concept,—whether visible or invisible, tangible or intangible, corporeal or incorporeal,—is a real substance as literally and truly as are our physical bodies, or as is the physical earth we tread, he has no right to attempt to convince the materialistic skeptic that the life, or soul, or spirit, is anything more than the phenomenal effect of motion among the brain and nerve particles.

If we once accept the modern philosophy which teaches that the ultimate molecules of all material bodies are actually separated from each other by many times their own diameters, and that they are inherently in constant

motion in various directions and at various distances, bombarding and jostling each other, then it is an easy matter for a scientific skeptic who believes it to offset our arguments for a future life by applying the same molecular view to the brain and nerves and thus find ready to his hand all the variety of motion required to constitute life and mind as but modes of molecular vibration. Let a clergyman, taught in modern science, admit the truth of this philosophy of the molecular theory, as he is obliged to do, that matter, even in its smallest molecular divisions, moves or can move without the agency of some actuating substantial force that is above and beyond material existence, and that moment he ties himself hand and foot at the mercy of the materialist. Haeckel would tell him, with a sneer at his religion, that there was as much evidence of soul or life in a quartz rock which forms into crystals by this very natural, all-pervading law of motion among material molecules (though its mode of molecular life does not reach our plane of consciousness and experience) as there is of life or soul in the brain of a philosopher.

How then is it possible for a minister, whatever his religious zeal or intellectual ability, who has imbibed the science of the schools with its molecular theory and modes of motion to successfully approach the scientific skeptic with the claims of a religious philosophy or impress him with any evidence of a future conscious state of existence that will have the weight of a feather on his judgment? His only way is first of all to divest himself of the molecular theory as a self-evident absurdity, and to plant himself firmly upon the first law of motion, that no material bodies however large or small (even the so-called ultimate molecules of bodies) can move of themselves, and that when at rest matter must absolutely and of necessity remain at rest till put into motion by an adequate and extraneous force. Then let him add the equally self-evident truth, which is the basis of substantialism, and which the discoverer of the first law of motion overlooked, namely, that an immaterial force which acts upon any material body, however small, so as to overcome its inertia and cause it to change places, must also itself be a *substance* of some kind, since it is an axiomatic truth that if a material body moves without the actual contact of some *substance* it must move of itself and its motion is therefore an effect without a cause,—a position to which even the mind of a child no less than that of a philosopher necessarily revolts. When this is successfully done and demonstrably illustrated by the im-

material but substantial rays of magnetism that pass off from a steel magnet and sieze a piece of iron causing it to move bodily, and which even exert this power after passing through the most impervious material bodies such as sheets of glass as if nothing intervened, it is evident that the candid scientific skeptic must be already more than half converted to a rational belief in the possible immortality of the soul, and be ready for the admission of even a probable personal and conscious existence for man beyond the present life.

To this now pending and rapidly tending triumph of religious philosophy, on the highway of scientific Substantialism, we are devoting our energies, and expect to give the remainder of our life; and it is the paramount importance of this radical and revolutionary work which forces us to keep up the incessant controversy with scientific reviewers who think they are doing a good work in attacking our sound departure, which we confess to be the foundation of our substantial philosophy. If all comers on this battlefield should be fairly met and vanquished by our arguments, then the most bitter of our opponents, if honest, will at once confess that scientific Substantialism has come to stay. But if we shall be forced fairly to succumb to the prowess and skill of even one armored knight, then *Substantialism* disappears in the smoke of the contest, *sound* becomes but the motion of air-waves as hitherto claimed, the other natural forces demonstrably follow as but analogous modes of motion, life, soul, mind and spirit become but the varied motions of brain-molecules, religion loses its entire foundation in Nature, reason, and science, and materialism, with a shout of victory, hoists its triumphant flag over the spiked cannon of its discomfited foe. We assert here that in our deliberate judgment all these results depend upon the issue of the battle we are now fighting in this campaign so vigorously waged against the current theory of acoustics—the representative and hitherto unquestioned “mode of motion” in physical science.

Many ministers all over the land are now recognizing the pivotal value of our warfare on sound for the final triumph of religion. We learn with joy that wherever scientific *Substantialism* is illustrated, amplified, and proclaimed from the pulpit by courageous and intelligent clergymen, as in the case of the Rev. Dr. Hamlin, of Poughkeepsie, N. Y., new life is sensibly infused into the sermons, increase in the attendance is plainly observed, and new interest is excited in the minds of thoughtful but skeptical men of the world, who are well known to regard the average theological sermon with

indifference if not with contempt. Give your thoughtful skeptical neighbors the insurmountable evidences of Substantialism as based upon facts gathered from science, and the open book of Nature, and let them learn that all around them the universe teems with invisible and intangible entities as really substantial though immaterial as are the gross bodies with which they come into physical contact, and it will not be long before they will gladly recognize God's workmanship and presence, and then add to this rational view of Nature the additional boon of the spiritual Substantialism of Christianity. Our noble friend and contributor, Rev. Dr. L. W. Bates,—the very first purchaser of the *Problem of Human Life*,—writes us:

“The sound discussion cannot be arrested: in fact, it has not yet reached its culmination, and you will have to repeat your arguments for the next twelve months. But I hope the time is not far distant when the acoustical giants can be induced to grapple with you. Such contest would be more entertaining than the “boys” play” you have hitherto had.”

We have thus taken occasion, as we did last month in our leading editorial, and as we did in the July number (Vol. 2) on the “Value of the Sound Discussion,” to impress upon our readers, especially ministers, the pivotal nature and importance of this *sound* controversy for the final overthrow of materialism and the ultimate establishment of a philosophical Substantialism that shall bridge the chasm that separates time from eternity, and man from his Maker. Well does Dr. Hamlin declare in his able and fearless article at the opening of this number of THE MICROCOSM, on “Substantialism and Redemption,” that to deny the substantial philosophy is to plunge at one step into atheism,—that to deny Substantialism is to deny Redemption, since it repudiates Christ as a divine and substantial Redeemer. How can God or Christ exist as a divine personality if immaterial entities have no existence in Nature? We commend Dr. Hamlin's article to the clergy who are still afraid to adopt Substantialism on account of its novelty and its opposition to received science.

PROF. STAHR IN THE REFORMED QUARTERLY.

NUMBER 1.

It now comes Prof. Stahr's turn for a settlement in THE MICROCOSM. By letters we have received from those who know the Professor, and who are familiar with the scientific repute in which he is held both in the Franklin and Marshall College and by scientists in other colleges, as well as by readers of the *Reformed Quarterly*, and of other papers of the denomination, we have been inclined to modify somewhat the estimate we placed upon his review in last month's MICROCOSM, and have come to re-

gard him as game decidedly worth bagging even at the cost of some considerable powder. In fact several correspondents—among them our esteemed contributor Dr. Balsbaugh, who knows all about him—advise us to spare no necessary space to make “clean work” of his case not only as a matter of record but as a warning to others. We have therefore given more room to this reply than we otherwise should have done but for these urgent letters.

Yet, notwithstanding the length of our reply, it is impossible to treat exhaustively each of the numerous points the professor skims over. We consider the discussion of a scientific proposition as almost useless unless handled exhaustively, and unless all there is in it is brought out. Should we do this with every phase of the discussion he has touched upon evidently in order to give his very superficial review the appearance of broadness, we would have to fill the entire editorial department of two numbers of this Magazine. Hence we shall only be able, after a general introductory argument and a general reply to his unkind attack, to examine and answer his strongest criticisms and so completely to turn them against him and the theory that both he and his friends will be glad to have us call a halt.

First of all let us look for a moment at the animus of the reviewer, and try if possible by a brief analysis of his attack to discover the motive which led to such a signally unfortunate and suicidal undertaking. If we closely scrutinize almost any disparaging or especially bitter review of a book prominently before the public, something is sure to crop out on its surface as the unmistakable key to the writer's motives, and which will serve as an explanation of his ugly feelings: and here we have a clear illustration. We may first note, as a suggestive fact the diametrically opposite view previously taken of the work in the same *Quarterly* by a prominent minister of the same Church—Rev. J. I. Swander, A.M., and then ask—why this striking disparity of opinion? Something must have influenced the mind of one or the other of these writers, aside from the real merits of the book itself, to lead to such exactly opposite conclusions, since two fair-minded, unbiased and educated Christian gentlemen would hardly have differed so widely in an honest criticism of the same book. Then the generous, dignified, kindly and scholarly style of the former writer, in such marked contrast with the often childish and bitter spirit evinced by the latter, can hardly fail to force an impartial judge to the conclusion that something besides a desire for the truth and a wish to present the readers of the *Quarterly* with a fair criticism of the work must have influenced the latter's criticisms. That there was and could have been nothing in the mind of the former reviewer in the shape of undue favorable bias to prejudice his review is manifest. He had not the slightest knowledge of the author personally or otherwise, except what he had gained from reading the book itself; and he certainly ought to have been as unfavorably impressed to say the least, with the unfinished literary style of the work as was possible in a critic so vastly his inferior in everything that goes to make up a scholarly writer. Yet his general verdict was exceedingly favorable to the book as readers of THE MICROCOSM are well aware.

Now wherein consists the true solution of

this marked discrepancy of views? Let us make it plain to the reader.

1. Prof. Stahr is an *evolutionist*; and of course in reading the book he was cut to the quick on seeing the favorite arguments of Darwin, Huxley, and Haeckel wrenched from their grasp and turned against them, thus suggesting the title of his review—the “Two-Edged Sword,”—though, funny to relate, he never once in the whole review attempted to turn one of our arguments against us, thus making the very title of his effort an abortion. Then, particularly must he have been exasperated in reading the rebuke we felt impelled to administer to his theistic-evolution brethren—Joseph Cook and Dr. McCosh—for their hasty and unnecessary concessions to atheistic evolution by their absurd modification of it, rather than manfully and courageously facing and refuting the whole theory as they might have done. Of course an evolutionist, and especially one of manifestly strong prejudices, on reading this rebuke in the very introduction of the book, would hardly forgive the author during the rest of the volume, but would rather be apt to read every subsequent paragraph with set teeth and clinched fists. That he is an unmistakable evolutionist, though not by the process *merely* of natural selection and survival of the fittest, he distinctly avows. Here are his words:—

“The writer of this article does not believe in spontaneous generation, nor in *evolution by the mere process of natural selection*. But he cannot help confessing that in reading the author's review of Tyndall, Helmholtz, Huxley, Darwin, and Haeckel, he finds himself all the time *unconsciously taking sides with those upon whose views Wilford feels himself constrained to animadvert so severely.*”

A pretty reviewer for a great Quarterly who can read a book so blinded by prejudice as to write his criticisms “*unconsciously*”! We propose to show in these strictures that neither *consciousness* nor *conscience* had very much to do with the performance.

2. But the chief motive for the intensely adverse view taken by Prof. Stahr—so exactly opposite to that taken by his brother minister, the Rev. Mr. Swander—is seen to crop out in every criticism of our arguments against the wave-theory of sound. Here is where the shoe pinches and hurts worst. He has been teaching that theory to his classes of physical science with learned pretentiousness for years; and he has no doubt constantly made his students think that he was *au fait* in everything pertaining to it,—that he had carefully investigated the whole subject by experiments and mathematical demonstrations, and that every thing about it was so absolutely settled and established that by no possibility could there be any mistake in the premises. Now, after all this, with many of those students looking him in the face, and remembering his learned instructions concerning Tyndall's tin tube and the lighted candle; about two unison instruments sounding half a wave-length apart and producing “absolute silence”; about a tuning-fork's prong “swiftly advancing,” cutting and carving the air when not traveling, as we have shown, at a velocity of one inch in a second; about a “sound-pulse” at a magazine explosion destroying buildings, and a score of like senseless things inseparable from the theory, it is quite natural that our Professor

would hardly wish to sit quietly and admit before those same students that the wave-theory had finally and hopelessly collapsed, and that too by the arguments of an ignoramus who did not know that in a Drummond light we use *lime* instead of carbon! The very thought of publicly confessing that one so ignorant could destroy a theory that had stood unchallenged for centuries, while such a learned and accomplished professor of physics as their teacher had totally failed to detect its absurdity, was more than the proud spirit of the distinguished exponent of physical science in Franklin and Marshall college could brook. Hence, as a lion that scents blood shaketh himself before going forth for his prey, so Stahr arose in his mathematical might and resolved that Wilford should no longer roam at large capturing the lambs of his scientific fold! He girded on his armor, as a war-chief girdeth himself for the fray, and determined to go forth unto battle not to return till the scalp of this disturber of the scientific peace of the colleges was strung to his reeking belt. His friends tried to dissuade, and advised him not to venture into the enemy's camp, and thus recklessly risk his own scalp in trying to get Wilford's. But he mournfully asked:—What is to become of me if this thing is allowed to go on? What will the public think of my judgment if I keep silent under such provocation and thereby consent that the best-established theory of physical science now taught,—one that I have believed from my youth up and have taught for lo! these many years—has broken down by the kick of an ass? Why, my students and fellow-professors will vote me a fossil of the most primitive type, and will point to my chalk marks on the blackboard as of about the same scientific authority as the frost-scrawling on a window-pane of a cold morning. No, it will never do to rest longer under the taunts and jeers—the slings and arrows—of this blaspheming scientific Philistine; so, sink or swim, survive or perish I will go for Wilford! So saying, he did go for him, with a "Two-edged Sword;" and if the reader does not soon see him return howling to his camp minus his own scalp it will be because he does not read to the end of this reply.

But a word more by way of introduction, before coming to the professor's criticisms. Has the reader ever considered the *comparative probability as to the correctness or incorrectness of our new departure judged by weighing the decisions of professors of physics for and against it?* Let us glance at this important factor in estimating (especially by the scientific laity), the value of our claim to public favor. While a number of no doubt able professors, such as Stahr, Carhart, Comstock, French, Strong, etc., have pronounced in public journals against the new departure, it is a fact also that more than one hundred professors of equal standing in colleges and as justly wearing the titles of A.M., A.B., and Ph.D. as the professors named, have pronounced in favor of the new doctrine and over their own signatures have denounced the wave-theory as a monstrous and now exploded fallacy of science, even after teaching it for many years,—some of them for more than a quarter of a century.

Now it is a fact that it requires no courage nor even thought or study on the part of a professor of physics to denounce the new depart-

ure as false and ridiculous. The chances are all in his favor and apparently he is perfectly safe in so doing. Every eminent scientist in the world as well as all who have lived during the last hundreds of years are with him in so deciding. Every text-book published contains the old theory, and every college and university in the world inculcates it, while one author only takes the opposite view, and he a man wholly unknown to scientific fame. Hence, by the law of chances, the risks are more than a thousand to one against the new departure being true, whatever it may claim and in favor of the wave-theory, and that, too, without the adverse critic, being required to read a dozen sentences in the whole *Problem of Human Life*. What inducement then is there for careful and rigid investigation on the part of such professor, in order to arrive at a definite decision against the new doctrine? Prof. Stahr, for example, feels that he is taking no risk at all, but on the contrary, that he is entirely safe in deciding adversely to our claimed discovery that the wave-theory is false. Hence by a thousand chances in his favor to one against him he decides naturally in advance of reading our book at all that we must be wrong; and consequently he would just as naturally afterward read under such conviction, and only enough to pick out a few weak points here and there in our arguments or calculations—just sufficient to make a "review" appear decently plausible to those who had prejudged the case in a similar manner to himself. Why read carefully or waste his time in close scrutiny of the whole premises when the book is necessarily wrong anyhow, and when the wave-theory must be right beyond a peradventure? Hence, he reads as a hungry wolf goes through a herd of buffalo on the western plains, seeking only the sick or lame animals, but steering wide as possible of the strong ones lest he get trampled into the dirt! Why waste his strength in fighting a healthy bull, when a crippled cow is close at hand? So, manifestly, did Prof. Stahr read the book he claims to have impartially reviewed.

But now, on the other hand, let us look at those professors, such as Capt. Carter, Prof. Kephart, Prof. Slingerland, Prof. Cox, and scores of others that we could name, who have taught the wave-theory for many years, and who stand just as high in just as reputable colleges as does Prof. Stahr, having earned A. M., Ph. D., &c., just as honestly and justly as has any alumnus of Harvard, Dartmouth, or Yale. These have deliberately decided that the *new departure* in acoustics is correct, and that the wave-theory of sound, though never before called in question, is a stupendous and unmitigated fallacy of science. Such decision on the part of such professors requires a high order of courage, and could not be conceived of as possible without the most thorough and critical investigation of the whole premises pro and con before taking such a hazardous step. They thus, by such a risk, defy the thousand chances against them so far as authority is concerned, and take the one chance to act against the whole world on the strength of their deliberate convictions based on a thorough examination of both sides of the question. Hence we assert that by the fair rules of logic such a professor who thus decides against the popular and received theory, and against such tremendous odds, and under such risks to his

reputation, is a thousand times more apt to be right by the law of chances than would be a professor of equal ability who decides hastily with the popular current and in favor of the popular view. By all fair rules of logic and counting the chances, with the risks to reputation and the inducements for avoiding all possible mistakes, we declare that one single Prof. I. L. Kephart, A. M., thus deciding, is worth more than a thousand Stahrs placed on the other side of the balance. The difference is about the same as where one undoubted witness testifies that he positively saw a certain event take place, while a thousand men equally reputable swear that they did not see it. Every logical mind would accept the one *positive* witness that the event did really occur, in preference to the thousand *negatives*, and would be safe in so choosing. In our judgment, therefore, looking at the case as not our own, we solemnly declare that the difference here described, in the actual weight and value of evidence in the two classes of testimony is a fair guide to the unscientific mind in reaching a conclusion on this or any similar subject.

This very state of things was illustrated and demonstrated when Copernicus published to the world for the first time that the Ptolemaic system of astronomy was false, and gave the reasons for so concluding. For many years thereafter not a single convert did he make, while more than a thousand of the most reputable scientists of that day decided without a moment's hesitation, and without looking at the new treatise, that Copernicus was evidently wrong and that the then popular and received theory of astronomy must be right. But what did all these thousand adverse decisions, made with the popular current, weigh compared to the one favorable decision made by Galileo who, after a searching investigation of all the facts in the case, risked his reputation and even his liberty in making it? They weighed just as much then as would the adverse decisions of a thousand Stahrs, Carharts, Comstocks, Strongs, and Frenches if now put in the balance and opposed by the single favorable verdict of Capt. R. Kelso Carter, A. M., C. E., professor of Higher Mathematics in Pa. Military Academy at Chester, Pa.

We have thus deemed it necessary to preface our reply by this general statement of logical considerations before entering into the real merits of Prof. Stahr's attack. And even now his introductory and disparaging remarks concerning us and the book require a passing notice before directly coming to his criticisms upon our sound-arguments. After opening by a couple of quite unobjectionable but commonplace paragraphs he ventures his first slap at the book as follows:—

"We believe that its tendency is *mischievous*, whatever the intention of the author may have been," &c.

He need have no misgiving about the author's "intention." We meant it to be "*mischievous*," and it has fully come up to our expectations. It has already played the *mischief* with the wave-theory of sound in many colleges, and Prof. Stahr will find that it has also played the *mischief* with his scientific reputation before he gets to the end of this reply. Well, therefore, may he pronounce the book "*mischievous*." He then proceeds:—

"And therefore we think that its general bearing ought to be examined, *even though*,

from a scientific point of view, its arguments are not worth refutation."

This last sentence would be *positively dishonest* but for the fact that the professor reads and writes "*unconsciously*." "*Not worth refutation*"! Why then does he try through 24 pages of the Quarterly to do what is not worth doing? No: had he not been "*unconsciously*" blind by prejudice his conscience would have told him while he was penning that sentence if he had read the book honestly, that however many minor defects he could find, it contains many arguments against the current theory of sound that he cannot answer if his life depended on the effort. And then what insufferable egotism to assert that scientific arguments powerful enough to convince scores of professors of physical science that the wave-theory is false were "*not worth refutation*"! This cheap way of disposing of difficulties may be sufficient to satisfy students at Franklin and Marshall college who are in the habit of taking what they know of acoustical science from Prof. Stahr's philosophical spoon, but he will be laughed at for such a stupid assertion by every candid man who reads the book for himself.

He then goes on to frame three different suppositions as possible standpoints from which the author may have written the book:—

"1. We can conceive that the author was honest in writing it, and really believed that there is some force in the arguments which he uses."

Struck it the first time!

"2. A second possible supposition is, that the author seeks only to win popular applause for selfish ends."

Missed it this time, all by bunglingly measuring other folks' corn in his own half-bushel!

"3. Or, finally, we may suppose that the author has a purpose in view [Right!], and that purpose is diametrically opposite to what it seems on the surface." [Wrong!].

In elaborating this third possible "standpoint" he goes on to suppose that the attack upon the wave-theory may have been all a "*clever though clumsy satire*." He then says, "the author of the *Problem of Human Life* seems to antagonize evolution and materialism,"—"a clever though clumsy" observation in the right direction in which however, he has been unfortunately anticipated by several evolutionists and materialists. And if we are not mistaken Prof. Stahr is also in a fair way of learning that the author "*seems to antagonize*" the wave-theory of sound in such a way as to be anything but a joke. To catch, here at the start, a glimpse of the mental cohesion of this erudite critic, who labors so hard to refute what is "*not worth refutation*," look at the following two self-contradictory sentences within two pages of each other:

"Nor do we wish to deny that the book contains *some good things*, and *some well-stated truths*," page 310.

"But we feel that some one ought to enter a protest in the name of both science and religion against the assumption that the book *fairly represents* either the one or the other, or that *any reliance can be placed in its statements*," page 12.

That is, no "*reliance can be placed*" in its "*good things*" and its "*well-stated truths*"! In this last statement as quoted he no doubt "*unconsciously*" hits the truth as he did about

the "mischievous" book. It certainly does not *represent* "science" from his "standpoint," and we are equally sure that from the same standpoint it does not represent any such "religion" as that which teaches that the Nazarene, on His mother's side, descended from an ape; so he is "unconsciously" right again.

We could thus, but for the precious room it would require, go through the entire introductory portion of the review and prove to the reader's satisfaction that the whole thing is either "a clever though clumsy satire" on book-reviews, or else that the reviewer himself is a clumsy though "unconscious" burlesque on critics.

But we must come now to the real battle-ground where the decisive conflict between Prof. Stahr and ourself is to occur, namely, the truth or falsity of the wave-theory of sound. Of course the Professor stakes all on this single contest, and so do we. And as a matter to be expected he will naturally open the battle with his best-aimed shot at the "mischievous" book. But will the reader believe it? *his very first position, or "fundamental" attempt at criticism, is a complete surrender of the wave-theory as false, and a flat confession that he himself knows nothing whatever of the true laws of acoustical science, while having no correct knowledge of the wave-theory as universally taught.* We have repeatedly charged both in the *Problem of Human Life* and in this journal, that no man can seriously attempt to defend the text-books on this subject, or answer our arguments against them, without contradicting himself and the theory at every turn of the argument. The simple reason for this is, that the present theory of acoustics is intrinsically erroneous, and hence while naturally in conflict with true science wherever found, it must, as a system of error, necessarily be in conflict with itself. Never was this truth in philosophy more clearly illustrated than by the attempted criticisms of Prof. Stahr as we will now show.

(Concluded next month.)

THE RAM'S HORNS AT JERICHO.

ANOTHER DEPARTURE IN SOUND.

THE Rev. John R. Skinner, of Bremen, Ohio, calls our attention to a new idea in regard to the breaking down of the walls of Jericho by the blowing of rams' horns as recorded in the 6th chapter of Joshua. It is suggested by a writer in the *New York Observer* that there was no *miracle* about it,—that it was a simple scientific experiment on the part of Joshua and the seven priests, causing the wall of the city to oscillate or sway to and fro by sympathetic vibration in synchronism to the atmospheric undulations of the tone sent forth from the ram's horns,—till the mortar of the structure gave way under the accumulated motion thus produced, and in this manner the wall was finally leveled to the ground. This ingenious writer says that "God knew the key-note of that wall," and of course Joshua must have been instructed about this important acoustical matter so that he could tune the seven rams' horns to an exact unison pitch of tone to suit this key-note of the wall or else, as he must have known, no sympathetic vibration could occur.

To prove the reasonableness of this new anti-miraculous theory, reference is made to important published scientific statements from the pen of Prof. Lovering, of Harvard College, which are so authoritatively given as to be worth quoting bodily for the edification of our readers, before proceeding further with our comments. The Professor says:

"All structures large or small, single or complex, have a definite rate of vibration, depending on their material, size, and shape, as fixed as the fundamental note of a musical chord. When the bridge of Colbroke Dale (the first iron bridge of the world) was building, a fiddler came along and said he could fiddle it down. The workmen laughed in scorn and told him to fiddle away to his heart's content. He played until he struck the *key-note* of the bridge, and it swayed so violently that the astonished workmen commanded him to stop. At one time considerable annoyance was experienced in one of the mills at Lowell, Mass., some days the building was so shaken that a pail of water would be nearly emptied, while on other days all was quiet. Experiment proved that it was only when the machinery was running at a certain rate that the building was disturbed.

"The simple remedy was in running it slower or faster, so as to put it out of time with the building. We have here the reason of the rule of marching armies when crossing a bridge, viz.: Stop the music, break step, and open column, lest the measured cadence of a condensed mass of men should urge the bridge to vibrate beyond its sphere of cohesion. Neglect of this has led to fearful accidents. The celebrated engineer Stephenson, has said, there is not so much danger to a bridge when crowded with men and cattle as when a few men go in marching order. The Broughton bridge, near Manchester, gave way beneath the measured tread of only 60 men. A terrible disaster befell a battalion of French infantry while crossing the suspension bridge at Angiers, France. Repeated orders were given to the troops to break into sections, but in the hurry of the moment and in the rain, they disregarded the order, and the bridge which was but 12 years old, and had been repaired the year before at a cost of \$7,000, fell. Tyndall tells us that the Swiss muleteers tie up the bells of the mules, lest the tinkle bring an avalanche down. The breaking of a drinking glass by the human voice is a well attested fact, and Chladni mentions an inn-keeper who frequently repeated the experiment for the entertainment of his guests. A nightingale is said to kill by the power of his notes. If we enter into the domain of music there is no end to these illustrations."

Now there is a grain of truth in Prof. Lovering's statements, but not enough to save the surrounding bushels of chaff from being scattered and dissipated by a single breath of common-sense. No man with the least scientific discrimination would thus indiscriminately mix two entirely different classes of phenomena together, and make no distinction whatever between the possible and the totally impossible in physics. Prof. Lovering relates the fact (!) of a musician *fiddling* an iron bridge so nearly down by striking its key-note as to frighten the builders, and makes it similar in effect to the well-understood synchronous swing of the heavy machinery of a factory in shaking a floor and spilling a bucket of water!

He crudely mixes up the shallow idea of the tinkling of a bell and its supposable effect in starting an avalanche, or the power of a nightingale to *kill* by its note (in what manner is not described), with the well-known effect of the swaying of a bridge by the synchronous tramp of a company of soldiers, and expects the innocent reader to take it all down together! Is it possible that the great scientists of our greatest colleges can seriously write out and publish such nonsense as these extracts contain?

That a fiddler could *sensibly stir* an iron bridge across a river by sounding a note on his instrument is simply laughable; but that he could dangerously sway the structure by the air-waves sent off from his violin-string, till the workmen would cry out in alarm, is too preposterous to be laughed at; and its contemplation, as a scientific Mother-Goose story, can only excite pity for a professor who could seriously relate it as true. Of course the theory is, as taught in Harvard College, that the air-waves sent off from the vibrating fiddle-string impinged upon the iron bridge synchronously to its own vibrational number or normal swing, after its *key-note* was struck, and that by a long succession or continued accumulation of these synchronous wave-impacts the structure would get to swaying more and more violently till it would finally break down. Yet our learned professor never took the trouble to reflect that no single strand or wire of that bridge could by any possible tension be tuned to vibrate synchronously or unisonantly to any tone within the violin scale, much less could the whole bridge be made to swing to and fro the one-hundredth part fast enough to vibrate sympathetically with the lowest note of the fiddle! This childish absurdity reminds us of the description of Corti's microscopic rods in the inner ear which are only the one *three hundredth* of an inch long, as actually vibrating sympathetically or unisonantly to every note of a grand piano,—even the heavy bass strings *five feet long*,—as so learnedly put forth by Helmholtz the greatest living physicist in his *Sensations of Tone!* Of course our small acoustical imitators are excusable for extending the theory to the Brooklyn Bridge if required when such superlatively ridiculous examples are set for them in the highest text-books on the subject.

The synchronous tramp of a company of soldiers, when marching to the music of a band, and which dangerously oscillates a bridge, is more than one hundred times slower than any synchronous vibrations possible to be produced from the violin. Yet this simple fact has to be stated here for the edification of the chair of physics in the foremost college in the United States! A professor of acoustics who could really believe such nonsense as this fiddle string story, and then print it for the instruction of children, is undoubtedly the right man to teach the wave-theory of sound which is made up of just such stuff as this. He is exactly the right man to teach also that the rams' horns of Joshua were all carefully tuned in unison before that eventful day, and that their pitch struck the "key-note" of the wall of Jericho which manifestly, if it had a key-note at all, would not have synchronized within a thousand vibrations in a second fast enough to be affected sympathetically by any note the seven priests could have made on their extemporized trum-

pets. Such professors are the very class of men who try to fritter away God's miracles by a fallacious theory of science that will not hold together a single minute under the calcium-light of truth. And such, also, is the scientific wisdom which would deny God's hand in creation, because per chance we happen to know that a tadpole sheds its tail in order to become a frog.

As a matter of course, it is well known to scientists that a glass goblet may be made so very thin and delicate that a powerful note sung into it, in exact synchronism to its own vibrational number, may break it; but that is no reason why a similar note should sensibly affect a suspension bridge across a river. Thunder has been frequently known to stir a window or jar certain portions of a house by sympathetic vibration, because such portion happened to be tensioned in unison to the pitch of tone which affected it. So an organ peal has been known to crack a window pane when tensioned in unison near to the breaking point for the same reason. But what has that to do with the swaying of a bridge under the synchronous tread of a company of soldiers? It is a wonder that Prof. Lovering had not made the *music* of the band to produce the swaying instead of the soldiers' tramp. Why not if there is either truth or sense in his fiddle story?

OUR POSITION SUSTAINED.

THE reader will recollect that we replied to Prof. Comstock of Knox College, Galesburg, Ill., in the July MICROCOSM on the sound question, in which we quoted his reference to the explosion of a detonating meteor 60 miles south of that place, and its effect in jarring a window near him simultaneously with the sound. We have received letters recently from parties at and near Mansfield, Ill., directly under the point of explosion who declare that the air-wave, sent off from the expanding gas of the exploding meteor, outraveled the sound for that short distance arriving and shaking buildings a sensible period of time in advance of the report, thus confirming our view as against the wave-theory, namely, that the *sound* is a distinctly different thing from [this incidental air-wave that accompanies it. Here, first, is what Prof. Comstock said of that meteor, reproduced from the July MICROCOSM:

"During the evening of December, 21, 1876, a detonating meteor passed south of Galesburg at a distance of some sixty miles. In about five minutes after the passage of the meteor a very heavy sound was heard, and at the same instant a window beside where I sat was violently shaken. There was no preceptible fraction of a second between the sound and the rattle of the window. No 'puff of air lagging behind the sound' caused the motion. Similar phenomena may be observed frequently during thunder storms. Indeed, half a dozen times within a month, I have noticed the sound of thunder and the rattle of the windows caused by it to occur at the same instant. And so the phenomena of explosions furnish no conclusive

argument against the wave-theory of sound."

We will now quote a letter on the subject received recently from Rev. M. Crews, of Mansfield, Ill., and then briefly repeat our explanation:

MR. EDITOR: Let me say to you, personally, that I am in possession of a fact which will throw light upon a statement made by Prof. Comstock; and aid in the demonstration of your theory, that in case of great explosions the condensed air-wave, for some time, precedes the "acousticity."

The detonating meteor which in Dec. 1876 passed about 60 miles south of Galesburg, Ill., passed nearly immediately over this place.

A. H. Scott, M. D., a gentleman of fine literary and scientific attainments, and far above mediocrity in his profession, says that his attention was first called to the *Aerolite* by the shaking of his house; and that *after* the shock came the *sound*. Remember it was a detonating meteor. All of which is respectfully submitted.

M. CREWS.

Our position is thus completely sustained against Professor Tyndall and all authorities on acoustics, namely, that the air-wave driven away from an explosion is not identical with the sound-pulse as they teach, nor has it anything to do with it, any more than has the *projectile* from the cannon with the *sound* that accompanies it. The condensed air-wave is as much a projectile as is the cannon-ball, and like the ball may or may not travel swifter than the report according as the quantity of exploding material that sends it is great or small. How plain is all this to the common-sense reader whose mind has not been incurably steeped in the poison of the text-books! Manifestly if a large quantity of powder should be exploded in a magazine, the air-wave driven off would for a short distance outstrip the sound, and would be felt to jar a building one or two miles away before the inmates would hear the report, just as was the case by the meteoric explosion at Mansfield, and just as would be the case with a cannon-ball if sent by a heavy charge of powder. Of course such a ball would crash through a building a few miles away from the cannon some seconds before the inmates would hear the report.

But in the case of the magazine explosion, the projected air-wave necessarily and rapidly decreases in force and velocity just as it takes in a wider and wider range of air, thus allowing the sound-pulse to catch up with it, say at *five miles* away, when both would be observed at the same instant, and by a superficial observer would of course be regarded as identical. But *ten miles* away the still rapidly expanding and weakening air-wave, losing velocity in the same ratio, would fall far behind the sound-pulse which, by keeping on at a *uniform* rate of speed, would be heard some seconds before

the atmospheric concussion would be felt if indeed the wave was not by that time too much dissipated to be noticed at all. But still further on,—say *sixty miles* away, as in the case of the meteor heard by Prof. Comstock at Galesburg,—no effect whatever would be produced by the condensed air-wave, the sound alone reaching the observer. Of course in such case any jarring of a window is alone caused by sympathetic vibration, some pane of glass or other portion of the window being tensioned in exact unison to the pitch of the tone heard. Such circumstance would naturally be sufficient to strike a superficial believer in the wave-theory like Prof. Comstock as the veritable effect of the same air-wave that crushes windows and even tears down buildings near to the explosion. As a matter of course such sympathetic action of the sound on the window (fully explained by substantial pulses in the *Problem of Human Life*), as observed by Prof. Comstock must occur simultaneously with hearing the report, just as thunder peals rattle windows tuned in unison to their pitch, though not the slightest air-wave, sufficient to stir a feather, is sent off by the loudest peal of thunder ever heard within even a few feet of where the bolt strikes. Why is this? Because no gas is generated and liberated by the electric discharge! Yet wave-theorists with all their boasted scientific learning are entirely unable to grasp these elementary distinctions, but still go on teaching the absurd doctrine that it actually is the *sound* of the explosion which breaks windows, destroys buildings and rends men and animals to fragments! All this because the current sound-theory teaches such transcendent and transparent nonsense. See Tyndall's *Lectures on Sound*, page 23, as discussed in the "*Problem*" at page 105 and onward.

WAS IT PROF. LUPTON?

A SUBSCRIBER from Montgomery, Ala., writes us that some years ago a gentleman came there and made application for a situation as teacher in one of the public schools. The school-examiners, in questioning the would-be pedagogue, among others put the question as to whether he held that the earth was *round* or *flat*, and as to which theory he should teach should his services be required. He replied that it would depend entirely upon "which view was considered most *respectable*." It is needless to say, his services were declined.

Our correspondent thinks it was Prof. Lupton of Vanderbilt University, though it might have been some one else of the same name. If it was not Prof. Lupton he can of course have the privilege of so stating in THE MICROCOSM.

A BELL RUNG IN VACUO.

A GENERAL discussion is now in progress in the *Mining Herald*, on the new sound department of the "Problem" and "MICROCOSM" in which the friends of *Substantialism* are opposed by adherents of the wave-theory. We notice, as a marked feature of all the latter's arguments, a deficiency in information naturally resulting from their *not* having read in this magazine our expositions of the very problems and points they bring forward. Not a single point supposed to favor the old theory have we yet seen alluded to, that is not completely solved and its force destroyed either in the "Problem" or in THE MICROCOSM. We will here only allude to a single phenomenon among many others referred to, which is sure to be adduced by the advocates of the old theory before their minds have been enlightened and which they grossly misunderstand, or they would have seen that it had not the slightest bearing on the case. We refer to the well-known and often-described experiment of a bell rung in vacuo, and the fact of its not being heard.

To show their want of any real comprehension of the problem involved, we say here that a small bell rung in a perfect vacuum can be heard distinctly throughout a large hall *if the sound has any other good conductor aside from the exhausted air*. Common sense ought to tell these superficial critics that sound will not travel without a conductor, analogous to the action of electricity. Hence, when a bell is suspended in a vacuum by fine, nonconducting threads, and rung by clockwork, it will not be heard outside because the air (the chief medium of conduction in such position) is taken away. But let the bottom of the receiver be a pine board, and let the shank of the bell rest embedded in this wood, and then rung, and it will be heard with about the same intensity in a perfect vacuum as when the receiver is filled with air. The reason for this is, that the wood takes the place of the air as a conducting medium, and air-waves, the great hobby of wave-theorists, are proved to have nothing to do with the hearing of the sound. As evidence of this, close both ears with your fingers and then touch your teeth to the wooden base of the receiver, and you will find that the sound of the bell *in vacuo* will be intensely heard with all air-waves or even air entirely excluded and ignored! What can explain these facts so well as the substantial or corpuscular nature of sound, analogous to the substantial currents of electricity? If any man is so poorly posted as to suppose electricity to be only the molecular vibration of the conducting wire, let him stand where the poor fellow recently stood in this city, and accidentally touch the conducting wire from Edison's electric light machine, and he will think, or rather his friends will think for him, that there is something *terribly substantial* passing through that wire which we call *electricity*! The man was instantly killed, and the inventor said that the current which passed through him would have killed a horse.

We would here inform those wise critics, who talk so learnedly about electricity as only the "molecular vibration" of the wire in order to help bolster up the preposterous and fast-fading theory that sound is nothing but air-waves, that horses would hardly be killed by

the "molecular vibration" of the end of a copper wire,—especially a vibration too trifling to be seen under a powerful microscope! *Substantialism* is the only salvation; and the scientific world must come to it sooner or later. It is simply a question of time, and the new departure in acoustics is gaining adherents and scoring triumphs even much faster than could have been reasonably expected even based upon truth, as it is, especially when we remember that the now self-evident departure of Nikolaus Copernicus in the science of astronomy was not taught in a single college till nearly a hundred years after the death of that eminent discoverer. We are therefore abundantly satisfied with the results of *Substantialism* thus far, with hundreds of professors of physics already outspoken converts and who are not afraid to denounce the wave-theory as already an exploded fallacy of science.

SOMETHING OUT OF NOTHING.

We have now on hand probably twenty or more articles on this prolific theme. Of course each contributor thinks his article the only one sent to us, and that it would be likely to settle the controversy if published. But these papers are about evenly divided in number and quantity of matter on the two sides of this question. We have positively read and read upon the theme in dispute till we scarcely know what we believe on the subject, or whether or not we believe any thing at all. Dr. Walker thinks it is no more unthinkable that God should create the universe out of nothing than that He should have always existed without a beginning. We grant it, and cheerfully admit that there is nothing pertaining to the infinite that is not unthinkable as regards a satisfactory solution. This is true of unlimited space, of unending or uncommencing duration. We cannot know the least thing about how God could create a material world from Himself either by expanding an atom of His substance or condensing a larger portion of it. Neither can we begin to know how it would be possible for even an Infinite Creator to make the smallest grain of matter out of nothing. Either view is a mere hypothesis, a conjecture, a speculation, which every mind has to accept or reject as seems most rational, or else conclude, as we have about concluded, that the whole subject is such a profound mystery that it is beyond the capacity of the human mind to discuss it at all with any degree of satisfaction. This is very nearly the point to which we have arrived; and this being so is it not wisdom in all believers in Christianity to accept the revealed truth that an intelligent God exists as the Creator of the universe, and let it rest there on Bible authority, at the same time using all the collateral proofs we may gather from Nature to support it?

We have indulged somewhat in speculation on this subject of the creation of Something out of Nothing, but it has only amounted to speculation and hypothesis after all. Nothing satisfactory has been reached, though we really felt at the time that it afforded the mind more satisfaction to conceive of the creation of the universe from God Himself than the impossible conception of its origination out of nothing. We confess, however, that the former view involves such inconceivable mysteries and un-

PROFESSORS STILL COMING OVER.

DEAR DOCTOR: Though I have known you but a short time, and that through your "*Problem*" and "*Microcosm*" I have come to feel that you are a very dear friend. Two years ago, being then a pantheist in belief, I determined thoroughly to examine the grounds of my faith and thus be able to render a "reason for the hope [or rather hopelessness] that was in me." I thoroughly studied the New Testament and was forced to confess that I could find therein nothing that any thinking man should oppose. But I was still a little shaky owing to my scientific views or what I then supposed were scientific. The Rev. Myron S. Robinson, Rector of Grace Church, Haverly, Dak., called my attention to late copies of *The Microcosm* and also to the *Problem of Human Life*. And I must say that while before this I was a doubting Christian I have since been a confirmed one. I believe Christianity will owe you a debt of gratitude which only God can repay. For one I feel as though very large scales had fallen from my eyes, and I thank you and, through you, the Giver of every good and perfect gift. I am glad to see that you show false theories no quarter, but I beg of you to let your blows be directed and tempered with charity which covereth a multitude of faults.

WE ship the following notice of our book from
the *Cannisto* (Steuben Co., N. Y.) *Times* :
A MERCILESS BLOW.

COUNTY.

The most important work on the relation of science to revelation for half a century is the "*Problem of Human Life*" by A. Winford Hall, of New York, a book of 524 pages, attacking evolution, and handling Darwin, Tyndall, Huxley and their competers without mercy. By clear statement, keen logic, apt illustrations and scathing sarcasm he demolishes their strongest positions and leaves them no place to stand upon. This man, unknown to fame, has lodged a stone in the forehead of the Goldfish of evolution, that has been defying the armies of the living God ; and the evolutionists stand back in utter consternation. No one dares to meet him on the main issues. He attacks alike the theistic and atheistic views of evolution, and while admitting the fact that these scientists have made discoveries and giving them great credit for their patience and perseverance, he shows that their patience and theories are struck heavier blows against its enemies than they both. The assumption that all the phenomena of nature are the result of physical causes is by attacking a favorite theory—the wave-theory of sound—on which Tyndall has lectured with great success. Although this theory is found in all our text-books and taught in all our colleges, he utterly demolishes it. No one has successfully undertaken to answer his arguments. It cannot be done. He is a wonderful writer, clear, logical, exact in definitions, fair to his opponents, yet often takes their weapons and disposes them. The friends of revelation should thank him for dragging out its enemies from their dens of false science, and for pouring upon them the light of truth. Working in the midst of millions of ages they were thought to be wonderfully wise, and learned men have bowed to their authority ; but it is now known that Tyndall & Co. cannot see farther into a Hall's discussion will put the Bible on higher grounds and give it a more honorable place.

... Two years ago I gave in the Boston *Investigator* what I thought was a very scathing review of your arguments against the wave-theory of sound. But I now give it all up. I did not know what I was writing about. I mistook your definitions of terms. I now see that your positions against the theory are undoubtedly correct. I am therefore very anxious to have your text-book on sound as soon as it is ready, and I hope you will follow it up with text-books on other scientific subjects, for I am determined to teach nothing else but what I regard as genuine science. What an astounding load the scientists of this age have to throw off! I find I have much to unlearn and expect often to require your help. Tyn-dall, Mayer & Co. must yet come out and refute your arguments or else stand convicted before the public as scientific cowards. It will not meet the case to stand at a safe distance and keep saying: "It is very funny"! The average student wants to see where the fun comes in. May your health and life be greatly prolonged for the work you are doing.

Your friend and well wisher,
CHAS. HENRY GODDARD.

PROF. GOODENOW ON PROF. COMSTOCK.

NEXT month we will print a neat little mathematic article of Prof. Goodenow in reply to the "ball and bat" illustration of Prof. Comstock as discussed by us in the July MICROCOSM, page 376. As *elasticity* is about to assume considerable prominence in the discussions of physical science in these pages, the very pertinent remarks of Prof. Goodenow are timely, if not to be indorsed in every particular, at least to inspire thought and lead to careful investigation. The reader will certainly be interested.

PROF. CATHER'S ATTACK.

WE still keep getting the *Weather Indicator*, each number furnishing an additional installment of his attack on Substantialism, and each number stating that he will add more in his next. Whenever he winds up his criticisms, if he shall ever do so, we will brush the whole thing aside by one general reply, but we do not care to waste time over it till he intimates that he is through. Several of our contributors suggest that we should pay no attention to his fanfaronade; but we differ with these friends, since Prof. Cather, with all his crotchety and lunny balderdash about "weather indications" a month ahead, hits some very sharp criticisms occasionally which, but for their palpable incoherency, might be of use. We shall wait patiently for him to subside and then THE MICROCOSM will sit down on this "Weather Indicator."

FREE TRADE AND PROTECTION.

MUCH of late years has been written on this theme from a purely political standpoint. We have no doubt our readers would not object to reading a couple of short papers on the same theme from the pen of a profound thinker, and treated from a philosophical and scientific standpoint. Whichever side of the question the reader may take, one thing is sure: he cannot feel otherwise than deeply interested in every sentence written on the subject by our able contributor, Isaac Hoffer.

INDECIPHERABLE WRITING AGAIN.

WE are nearly discouraged with the careless manner in which *some* correspondents write the names and addresses of subscribers. They seem to think because they are familiar with the name, and because their own chirography appears plain to them, that our clerks can see it through their eyes. We have the name of a subscriber, for instance, that may be *Trow*, or *Town*, or *Train*, or *Tever*, or *Tenor*, or *Tewer*, or *Turin*, or *Tunis*, or *Teson*, or *Toson*; or possibly the first letter may be *S*, or *F*, or *G*, and which, of course, changes everything, as it looks like one of them about as much as another. Now all this costs valuable time on the part of the booking and mailing clerks, and what is worse it may cost the subscriber the loss of his MICROCOSM, for we are ten times more apt, under the circumstances, to send it wrong than right. Then next comes a correspondence with the writer of the letter as to why Mr. *Grove*, as it turns out to be, has not received his magazine, as the money was sent so and so, thus taking up more valuable time and postage, all because the writer in the first place did not write *Grove* in plain letters as he might have written it had he tried. We can of course make out the body of a letter, as a general rule, if it is composed of quail-tracks; but names and addresses must always be written *legibly* as they are outside of the domain of guess-work. Will our agents and correspondents think of these things?

CAPT. CARTER ON SOUND.

NEXT month we expect to begin the publication of a series of papers on Acoustics from the critical pen of Capt. R. Kelso Carter, A. M., professor of higher mathematics in the Pennsylvania Military Academy. Capt. Carter was among the first college professors who saw the force of our objections to the wave-theory as now universally taught, and was one of the first (Prof. Kephart only preceding him) publicly to indorse the new departure. On the start of THE MICROCOSM his able pen began to furnish articles for its columns on that subject, and his careful practical experiments have been of no little advantage to its editor or interest to its readers. We are glad to count the Captain among the permanent converts to the new doctrine of *Substantialism* and as a most efficient aid in our warfare upon the old theory of sound as a mere *mode of motion*. He realizes as do thousands of others that this sound-controversy is the key-note of the bugle-blast for the grand assault upon materialistic science.

"RETRIBUTION, HEAVEN AND HELL."

OUR excellent contributor and profound thinker Dr. Balsbaugh sends us privately his opinion of Mr. Barnes' *Retribution*, which we take the liberty of copying as follows:

"I have read *Retribution*. It is stunning in the vastness of its reach, and no less so in the boldness of its speculations and conclusions. Mr. Barnes evidently wrote out of the fullness of personal experience in relation to the solemn and perplexing problems he treats. But he has not mastered them. They are too high and deep for the solution of the human mind in the present state. I had for myself traveled over

the same ground, and in many points had reached the same conclusions. He is instructive and impressive, and will make a profound sensation and tremendous stir. I have no doubt the work will do vast good to many minds capable of taking in its great thoughts. The points at which my mind revolted most were his distinction between evil and sin, and the abolition of memory among the redeemed, so as not to mar the heavenly recognition. It is a rare book to make one think and feel in the right direction. It makes the soul awfully alive with the sublimity of moral being. Sin becomes exceedingly sinful, and holiness the supreme good. I intend to read it several times.

C. H. B.

MICROCOSMS BOUND IN CLOTH.

We are now ready to mail bound copies of *The Microcosm* as follows:

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Persons not subscribers, can become such by remitting \$1 for Vol. 3, and thus secure the low rate for Vol. 1, as above. Those having sent money for these volumes will receive them immediately by mail postpaid. Vol. 2 will not be published separately at present.

DR. KAVANAUGH'S ANSWER.

Owing to our long reply to Prof. Stearns in this number of *The Microcosm* we are obliged to omit a reply to Dr. Kavanaugh's article which will be found elsewhere and will no doubt be read with interest. Our remarks upon his explanation of how the moon gets around the earth will appear next month, with other editorial matters for which we cannot possibly find room in this month's issue. Be patient with us and we will pay you all.

"WHY DISCUSS SOUND?"

Still a few of our readers, who have not carefully observed what we have said on this matter in former numbers, inquire the meaning of so much on the sound question. We cannot answer these inquiries better than by quoting a part of our little article on this very point as printed in the last number of last volume:

"It follows, therefore, whether clergyman will seek or not, that the only successful way to meet and overthrow materialism and take from it these powerful philosophical arguments against the substantial existence of the soul after the body dies, is to break up and pulverize its foundation in physical science by showing that every force or so-called mode of motion in Nature is a real incorporal entity or immaterial substance. Our very first discovery was to see that the clergy were hopelessly involved by their thoughtless concessions to physical science as taught in all the colleges, which virtually made the mind and the soul but modes of molecular vibration just as materialism claims. As proof of this we show in the *Problem*, at page 71, that the eminent Joseph Cook in his very strongest effort to vindicate the immortality of the soul, actually gives it away to Huxley and Haeckel by comparing the soul to

A good opportunity now offers to the friends of this journal to give the ear of *Substantalism* a shove ahead. We met with a mishap in printing the August number, and have 10,000 copies so defective (though readable) that they will not do to send subscribers. These are a dead loss to the world unless given away to be read. We dislike to ask help from our subscribers even in such a good work. Several who have learned of the mishap, have volunteered to send or hand copies to friends who might possibly become readers and thus be benefitted. Capt. Carter sent for 50 copies to distribute, as he says, to spread *Substantalism*. We will send free to any who will thus aid us, and thus aid the cause.

SPOTTED COPIES OF AUGUST NO.

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WILFORD'S MICROCOSM.

Vol. III.—No. 3.

NEW YORK, OCTOBER, 1883.

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Single Copy 10 Cts.

WE LIVE FOREVER.

BY DR C. H. BALSBAUGH.

Some people have great trouble with the Divine disposition of sinners in the future life. What will God do with the lost? is a theme that occupies many great and serious minds. Restoration is most agreeable to some; while others see in annihilation the highest justification of the Divine character. Both marshal a long catalogue of proof-texts in corroboration, as they suppose, of their doctrine. It is certainly an awful subject in any view we take of it, and we cannot settle it any better than God has settled it in the essential constitution of man, and in the Divine assumption of humanity. Proof-texts by the score, or by the thousand, however rigid their literal import, can never demolish the great argument of God in the intrinsic elements of moral being. The incidental must ever be interpreted by the cardinal and essential, and not *vice versa*.

I have before me a letter from one whose life is "a great horror of darkness" under the crushing, tormenting consciousness of ill-desert, and he thinks he has found the panacea for his woes in a book which recently came into his hands advocating the sad doctrine of annihilation. That door of escape from a mis-spent life is wholly imaginary, being an utter and absolute impossibility by the necessary terms of responsible existence. God has from the first promised His Son, and this promise was not arbitrary, but in perfect consonance with our moral constitution, which is precisely the same ground that insures our endless perpetuity. God is merciful and omnipotent, but he is limited in His actions by the absolute conditions of His nature. He does not save and damn, or create and destroy, for a mere exhibition of His power or feeling. Compulsion is not salvation, and annihilation is neither mercy nor righteousness. Being made in the image of God, and being redeemed by God incarnate, we need no proof-texts to give the lie to these facts, and put God to shame for making man at all, and becoming man Himself.

The primal truth of our personality is that we belong to the future. Can any reader of this paper say that he is an exception? This fact wanting, humanity is wanting. The sense of immortality is natural to man. The dread of immortality is begotten of sin. This dread is father to a wish, and this wish, like all wishes born of sin, soon finds arguments to second the inclination and low gratifications of our apostate nature. Nothing below man can by any possibility be made conscious of a posthumous state. Any being of such inherent capacity, is immortal, not by character, not by the simple fact of existence. This correlation of God and man is the ground of the Divine Incarnation. Take immortality from humanity, and there is neither possibility of sin, nor necessity of redemption. Annihilation has its vitality in the misapprehension of both God and man. No sense of moral defection, no con-

sciousness of relation to an Infinite Personality, no shaping of life by motives derived from eternity, is possible to a being not endowed with endless existence. God never acts arbitrarily. He does not extinguish life by sheer omnipotence, not even the life of a gnat. The second death is spiritual, and is no more extinction than inner death pre-mortem. Death in tresses and sins is but a mode of life, here and hereafter. The devil and his angels live to-day after being dead so many centuries and millenniums, in all the elements that give to the life of God all its significance. Immortality in the simple sense of being is one thing; immortality in the sense of eternal life, as the term is used in scripture, is vastly different. Everything after its kind, includes God's generation of man. The inner, invisible, incorporeal entity is the true humanity. That is a spark of the Divine essence, and cannot be annihilated save by a ruthless act of omnipotence, setting aside all Bible-begotten and science-verified conceptions of the Divine integrity. Annihilation finds no support in the conviction that God is a being of infinite wisdom and forethought. If man is not immortal why blast him out of existence by a special exhibition of Divine power and anger? If he must needs die, then let him die. But if his creation is not a blind, blundering experiment, immortality is his birth-right. On the day of transgression he dies in a deeper sense than he could ever die again. In a deeper sense, not deeper degree. The second death is more second as to the time and degree than kind. How dead humanity is, as the result of that single act in the garden of Eden, as regards *relation*, is witnessed by the Divine Incarnation as the only means of closing up the breach. How dead we are as to *quality* of being is demonstrated by the fact that nothing but the immanence of the Holy Ghost can now create us in the likeness of the Godman. Sin affects not our being, but its condition. To be is not the problem of sin, but how? In volition we change relation and character, but live on, and must, or not be human, or God neither wise nor righteous. Nothing but Divine caprice and passion can render extinction of moral being possible. Tyndall's and Huxley's gospel is far more consistent,—shocking, God-dishonoring, man-debasing as it is. If man can live after death, and independent of corporeity, all the arguments of science falsely so-called, are the veriest sham. If post-mortem life and resurrection are possible, and if the very nature of humanity demands these verities, then annihilation is not a whit behind materialism in palpable antagonism to Divine and human psychology on which the whole Bible is based. To plead resurrection and annihilation is to represent God at odds with Himself.

The first record of man is his consciousness of the Eternal, and his obligation to Him. Deny this, and Gen. 1: 28 becomes the emptiest nonsense. Admit it, and the immortality of a Divinity-essenced personality is conceded. The contrary is neither demonstrable nor conceivable. Men cannot think of God, nor be in-

fluenced by considerations of His character, without community of being. God must in-breathe the elements of His own constitution before a being can exist capable of moral government, or the faintest consciousness of obligation to an invisible authority. Just as little as mind and conscience are the efflorescence of matter in its highest refinement, can God become incarnate in a being not bearing His likeness. Sin defiles and disfigures and perverts the image, but does not destroy it. The sea of glass and the lake of fire are both receptacles of constitutional copies of Deity. But no God-charactered soul goes to hell, and no sin-blackened being enters Heaven. There is a great gulfixed, a gulf of eternal necessity and eternal duration. "I am tormented in this flame." "The smoke of their torment ascendeth up forever and ever." "These shall go away into eternal punishment, but the righteous into eternal life." One word in the Greek expresses both facts. One thought rules the Divine mind in relation to both classes. One constitutional entity gives consistency to the Divine decree. Saved or unsaved we live forever. No use quarreling with God and saying, "Why hast thou made me thus?" "Who by searching can find out God?" "He giveth no account of His matters." "The Judge of all the earth must do right." The Universalist so emasculates God of his righteousness as to leave no room for hell. The annihilationist so empties God of His mercy as to forestall the essential mortality of humanity, and make a universal arbitrary holocaust. We live forever, or the whole Bible turns into an inexplicable riddle, and the sinner gives the lie to his own being every time he thinks of God and eternity.

UNION DEPOSIT, PA.

DIMINUTION OF SOUND-MOTION.

BY PROF. W. H. H. MUSICK.

Prof. Tyndall says on page 10 of *Lectures on Sound*:—"You have, I doubt not, a clear mental picture of the propagation of the sound from our exploding balloon through the surrounding air. The wave of sound expands on all sides. The motion produced by the explosion being thus *diffused over a continually augmenting mass of air*. It is perfectly manifest that this cannot occur without an *enfeeblement* of the motion. Take the case of a *shell of air* of a certain thickness with a *radius of one foot*, reckoned from the center of explosion. A shell of air of the same thickness, but of *two feet radius*, will contain *four times the quantity of matter*; if its radius be *three feet*, it will contain *nine times* the quantity of matter; if *four feet* it will contain *sixteen times* the quantity of matter, and so on. Thus the quantity of matter *set in motion* augments as the *square of the distance* from the center of the explosion. *The intensity or loudness of the sound diminishes in the same proportion.*"

Does Prof. Tyndall mean to say that this "*enfeeblement of the motion*" is by reason of work done against the resistance of this "*continually augmenting mass of air*" or that this enfeeblement is in direct proportion to the whole mass of air put in motion from the point of explosion outwards? Or does he aim to say that the enfeeblement from shell of

radius one, to shell of radius two, or three, or four, is directly as the difference between their spherical surfaces respectively? If this is his meaning, there is *no real* enfeeblement or loss of motion, but the diffusion of motion over a larger surface, the intensity diminishing directly as the surface increases. Dr. Stewart says that sound-motion is ultimately converted into heat. (See conservation of Energy, p. 92.) This conversion is in virtue of work done by the sound-wave against the resistance of the air. There must, therefore, be some *definite* proportion between the diminution of motion, and the whole amount of air moved by the sound-wave. If Prof. Tyndall attempts to give us this ratio in the paragraph quoted, his figures are wrong, as showing the ratio of increase of spherical *surface*, instead of spherical *contents*. With spheres of radius one, two, three, four, respectively, we have contents as one, eight, twenty-seven and sixty-four.

But even if he has reference only to the amount of air contained in concentric shells of indefinite thickness surrounding the point of explosion; his statements are inaccurate, to say the least. The cubic contents of a shell one inch thick, of one foot radius is 1662.9536. According to Prof. Tyndall, a shell of equal thickness and twice the radius should contain $1662.9536 \times 4 = 6651.9536$; but it does contain 6940.8416. A shell of three feet radius should contain $1662.9536 \times 9 = 14966.5824$; but it does contain 15837.8528. A shell of four feet radius should contain $1662.9536 \times 16 = 26607.2576$, but it does contain 28353.9872. A discrepancy will be found with any assignable thickness of shell, but the greater the thickness, the greater the error.

If Prof. Tyndall meant the surface-area of a sphere, why did he not say so; and then the paragraph would not be misleading to the many young students who would almost discredit the deductions of mathematics, rather than doubt his statement of fact.

VANDALIA, MO.

A REMARKABLE INCIDENT.

BY COL. JOHN M. PATTON.

I was much interested in the several communications to *The Microcosm* on the diffusion and penetration of sounds, as illustrated by the inability to hear the rolling of a train of cars passing at the distance of half a mile; and the distinct audibility of the same train after it had increased its distance from the hearer to two miles. The fact that the phenomenon was uniform and independent of the direction of winds and other atmospheric conditions (if I understood aright) gave increased interest to it. The explanations given at various times by Mr. Tyndall in his report on fog-horns, fog-bells, steam whistles, &c., and the explanations given by others, leave us in doubt whether the resonant qualities of superficial soils or sub-soils, the varying densities of adjacent air-strata, or the funnel or other shaped contour of the country—one or all may give the true solution of it. I have not understood you in the "*Problem*" or *The Microcosm*, to object specially to any particular solution of it, whether propounded by Mr. Tyndall or others; but only to claim that the wave-theory could not

so satisfactorily adapt itself to any solution, as could that of substantial emanations of sound, by a law of conduction of its own.

This paper is not designed to propound any view of the matter, nor to discuss any already propounded; but simply to provoke from you some explanation, whether more or less satisfactory of an incident more remarkable, I think, than any mentioned by Mr. Tyndall. Indeed some people may think it rather a "hard story." To be sure of the correctness of the facts, I consulted with Dr. R. A. Lewis, Assistant Surgeon of the regiment to be mentioned presently, and himself distinguished as a teacher of natural science, by whom the facts to be stated are fully verified.

On the 16th day of July, 1861, the 21st Virginia Regiment of Infantry (afterwards attached to the famous division of "Stone-wall" Jackson, and serving under him till the close of his career) left Richmond on the cars for Staunton, Va. After halting at Staunton for a day or two, it marched westward for Huntersville in Pocahontas county. About 3 o'clock, P. M., on the 21st day of July, they went into camp about two day's march west of Staunton and immediately after they heard distinctly the roar of cannon. So constant, distinct and apparently near were the discharges of batteries and single guns that the Colonel of the regiment was convinced that a Confederate force not far off was engaged in battle with Rosecrantz near McDowell, and rode to the top of Shenandoah mountain, where he met with several persons, who informed him that all was quiet in front of Rosecrantz. The next day the regiment pursued its march westwardly; and being now out of reach of railroads and telegraphs, it was more than a week before they heard any explanation of the artillery fire, when they learned that on that day occurred the great battle of Manassas, and that there had been no fighting anywhere else. It was impossible to doubt that the sound of the guns heard by them came from that battle-field.

Now it is to be observed that this regiment was then in the midst of the Alleghany Mountains, the Blue Ridge range of mountains, and "Southwest range" (east of the Blue Ridge and parallel to it, at an average distance of 20 miles) both intervened between the hearers and Manassas, and that the distance between the two points in an air-line is about 140 or 150 miles, as may be seen on any good map or atlas. I afterwards learned from various people living between the two points, at a distance of from 30 to 40 miles and upwards from Manassas that these guns were not heard in their county.

In addition to these facts, I have been informed reliably and responsibly that at a later period of the war, the guns of the battle at or near "Harrison's Landing," on James River, were "distinctly audible" at Amherst Court House in Virginia—a distance of about 160 miles—but for this last fact I cannot vouch, as for the others.

I am well aware that any solution of such phenomena, must, in the present state of our knowledge, be more or less speculative, and would depend on many conditions as to soil, contour of country, atmospheric conditions, &c., &c., which I cannot supply; still I have thought that even if no satisfactory discussion

of it can at present be made, the fact itself is worthy of being noted.

BENTIVOGLIO, VA.

THE WORLD SAVED THROUGH A NATION.

BY PROF. MELVILLE DOZIER, A. M.

Of the many loose and erroneous ideas of Gospel teaching, the doctrine that Jesus Christ died for the human family, as a race, is among the most productive of evil results; for it loses sight of one of the two grand pillars of truth on which the Gospel superstructure rests;—namely, the Kingdom of God, or the Commonwealth of Israel.

Nothing so thoroughly simplifies and elucidates the dealing of the Almighty with mankind, both in the past and for the future, as the conception that, since the days of Jacob, he has spoken to the world only through a given nationality.

Up to this period in human history, God manifested himself to individuals, without apparent reference to their national relations; but thenceforth he has revealed himself to the world only through the natural descendants of Abraham, and through those of the Gentile world who have acquired citizenship in the wondrous Commonwealth in store for that people.

"The Kingdom of God," so frequently referred to in the Sacred writings, is, in the estimation of the great majority of Christians, an indefinite, disorganized institution, without a capital, without a definite territory, having no certain and unquestioned code of laws, and no recognized administration of the law. Christendom does indeed recognize the King of the Kingdom in the person of the Christ, but, at the same time, it robs him of every regal function.

Indeed, a very large proportion of Christian literature becomes unintelligible and absolutely meaningless when construed in accordance with the prevailing conceptions concerning the Kingdom of God. Let it be remembered that the divine commonwealth is as old as the exodus of the Israelites from Egypt. Under the recognized leadership of Moses, in the peninsula of Sinai, in the year of the world 2463, this divine State was organized, and endowed with a code of laws for its government.

It continued to exist as a separate, distinct, and altogether marvelous government, under the divinely appointed successors of Moses, through a series of centuries, and down to the time of its final absorption by other nations of the world.

During all this time the history of the people was the history of God's direct dealings with the human family; and a marvelous history it was. Time and again did the stiffnecked nation revolt against the authority of their divinely commissioned rulers, and violate their covenants with God.

So frequent and so violent were its plunges into sin, that either the annihilation or the redemption of the nation became a necessity. The latter course was adopted, for by this means only could the covenants with Abraham and David be executed. But, by what means could a guilty and condemned nation

be rescued from a penalty of condemnation; namely, death! "The soul that sinneth, it shall die"; either, by persistence in sin, it must die to God and to immortality; or else, by some means of atonement, it must die to sin, and rise to newness of life.

But "without the shedding of blood there is no remission of sin," and the blood of animals cannot avail to the taking away of sin. Manifestly, then, the redemption of the nation rests upon the shedding of human blood; and that, too, of a constituent of the nation. Nay, more, it must be the blood of the head of the nation, for by him alone can the nation be represented. Nor can it be the blood of a sinful man, for sinful flesh cannot atone for sinful flesh, being itself under the condemnation of death.

In whom do we find these conditions combined save in the person of Jesus of Nazareth, the son of Mary, the heir apparent to the throne of David, and the only begotten of the living God? Through the death of the Christ the nation, as such, is redeemed; and "what God redeems, that will he save." Notwithstanding the present and long continued distribution of the constituents among the various nationalities of the world, and their persistent enmity to Christianity (entailing certain death upon every individual so persisting), yet the people, as a peculiar and a distinct people, have been and will continue to be preserved until they are reorganized in their own land, as a nation, under the recognized and personal kingship of the Messiah.

But, if Jesus died only for the Israelitish nation, how can anyone not a natural constituent of that nation share in the redemption purchased by his death? Precisely upon the same principle that members of alien nations become participants in the privileges and benefits of the American nation; namely, by renouncing their former allegiance, and taking the oath of fealty to the constitution, laws, and properly constituted authorities of this country. This in principle every true Christian does who intelligently recognizes the "King of the Jews" as his Lord and Master. All such, whether dead or alive, will be added to this redeemed nation when reorganized, and will freely participate with them in the matchless immunities that await the commonwealth which is destined to fill the whole earth with the glory of God, and to subjugate all nations to its dominion.

Nor has God provided any other means of salvation or redemption. In Abraham, and in him alone, shall the world be blessed. If we are not Israelites by birth, we must become such by adoption, in order to become joint heirs with Jesus Christ to the grand estate in store for him.

I cannot better close these remarks than by the definition of the Kingdom of God as given by Rev. Dr. S. A. Taft, in whose preaching the thoughts herein set forth are taught with great efficacy and clearness. He defines the Kingdom of God to be "That grand Theocracy, divine Commonwealth or Polity, that has the Messiah for its King; the Jewish people fundamentally (augmented by additions from the Gentiles) for its nation; Jerusalem for its Capital; Mt. Zion for its seat; the Holy Land for its dominion, and the whole outside world for its empire."

SANTA ROSA, CAL.

IS MAN'S RELIGIOUS NATURE AN EVOLUTION?—No. 5.

BY REV. JOS. S. VAN DYKE, A. M.

With firm faith in the final adoption, even by scientific men, of the Scriptural account of man's origin, we do well to note the fact that evolutionists have chosen a mode of arguing that is unscientific. They have virtually abandoned the inductive method recommended by Bacon, the father of modern science. True, they still profess to pursue it while substituting hypothesis and suggestions and analogies and a-priori reasoning. They seem to have forgotten the scientific requirement that in interpreting Nature only causes which have a real existence and are adequate to the production of the effect are to be taken into consideration. Causes are assumed the very existence of which can not be satisfactorily proved, much less can they be shown to possess potency adequate to the production of the effects attributed to them. In not a few instances, the explanations given proceed upon the principle that the effect produces the cause. Mr. Darwin, when attempting to account for the origin of human affection, assumes that in animals the desire of caressing, springs from the habit of caressing. He also traces the growth of speech to man's mental powers and the growth of mental power to the use of language.

Professor Tyndall boldly defends the a-priori method of procedure claiming free scope for the imagination and unrestricted liberty to the discursive faculties. In this he has the endorsement of Mr. Herbert Spencer, whose method of reasoning is emphatically a-priori. Whoever will take the pains to examine his writings will find, amid much that is admirable and not a little that is somewhat misty, clear evidence that the inductive method has been virtually abandoned. Thus it happens that though evolutionists have not succeeded in proving that a single savage has descended from the monkey family, nor indeed that such evolution is possible, they nevertheless expect us to believe their theory. If we object, they assure us that the element of time will certainly work these marvelous transformations. How? Lo, no attempt is made to show that the mere lapse of time will affect the problem; nay, it is not even proved, in man's case at least, that these insensible gradations become perceptible after the expiration of fifty centuries. A vivid imagination and a strong subjective faith may be considered as dispensing with the necessity of an objective verification. In the place of Tertullian's maxim, "*Credo quia impossibile est*," they seem disposed to substitute *Credo quia comprehensibile est*. If under the glare of their cherished theory certain propositions are to them conceivable, the inference is drawn—especially if phenomena hitherto inexplicable are seemingly solved—that they have removed the veil from Nature's laboratory, disclosing the actual processes by which higher forms were successively introduced till the phantasmagorical procession ended in man's appearance upon the stage as an unclothed savage. Whilst studiously ignoring all parts of the extended problem except those which may be more readily connected with brute instincts, they expect us to believe that science enjoins the acceptance of the doctrine that man in all

his faculties is the natural offspring of some branch of the Simial family. "Lay Sermons"! If such is their teaching, it is possible that a majority of mankind may continue to prefer the "threadbare" instructions of a ministry ordained by the hands of a church which, whatever her weaknesses, still retains faith in "God, the Father of us all."

CONCLUSION.

1. Has it been proved that man's religious nature was not an original endowment? No.

2. Has it been proved that because some savages are without religion, therefore this was man's original condition? No.

3. Has it been proved that man, if he once possessed religion, could not lose it? No.

4. Has it been proved that a vague faith in mysterious beings can evolve itself into theism, provided a few thousand or a few million years are thrown in as a co-operating agent? No.

5. Has it been proved that religion is a product of human thought? that it is the drift-wood thrown upon the shore of the ceaselessly agitated ocean of human feeling? that it may have had its origin in an ill-defined "wish, hope and fear?" No.

6. Has it been proved that savages have arisen, unaided, to an adequate conception of their relations to Deity? No. "Some savages have no religion." Have any of them acquired a system of religious faith by their own exertions? The theory that a race can advance by its own unassisted efforts from a lower to a higher religious faith is unsupported by facts. It may rise by instruction; but of what avail is instruction if there is no in-born power? Some barbarians have religious ideas. How did they acquire them? The simplest answer is that they were carried down with them as they sank into moral degeneracy.

7. Has it been proved that man, if originally an irreligious savage, could have evolved religion? No: far from proving that man has developed religion, it has not yet been proved that he could do so.

8. Has it been proved that the earliest races were without a moral and religious nature? No: it has not even been proved that they were without spiritual ideas and religious ceremonies.

9. Has it been proved that man's worship is the same in kind as the feeling of a dog towards his master? No. It has been asserted, however, and that in the judgment of some will answer the purpose almost as well. An error repeatedly and confidently asserted is the next best thing to the truth.

10. Has it been proved that the accepted theory is environed with more difficulties than the new hypothesis? No. "The old is better."

It is for our readers to judge to what extent we have aided them in perceiving that the time-honored doctrine is more tenable, more logical and more consistent with facts.

As a rule attacks upon Christianity, whether metaphysical or scientific, do not so injure it as to obscure the hope of ultimate triumph. Unfortunately, these assaults may prevent its adoption by some, and may weaken the faith of others, but the confidence of God's people is in no respect shaken. As has been beautifully said: "Christianity, like Rome, has had both the Gaul and Hannibal at her gates; but as the Eternal City, in the latter case, calmly offered for sale, and sold at an undepreciated price,

the very ground on which the Carthaginian had fixed his camp, with equal calmness may Christianity equal her magnanimity. She may feel assured that, as in so many past instances of premature triumph on the part of her enemies, the ground they occupy will one day be hers—that the very discoveries, apparently hostile, of science and philosophy, will be ultimately found elements of her strength."

Is it impossible to justify Principal Dawson's affirmation, "This evolutionist doctrine is one of the strangest phenomena of humanity."

FREE TRADE AND PROTECTION.—No. 2.

BY ISAAC HOFFER, ESQ.

Mr. Wells complains that "our merchant marine, or carrying trade upon the ocean—a branch of industry once second only to agriculture—has practically ceased to exist," and declares that our protective system is the main cause of the decline. Mr. Wells forgets that there is *free competition* in the ocean carrying trade, and that if we have been losing this trade in the past we cannot regain it in the future unless through government aid.

The truth is we cannot compete, where the natural advantages are equal with the cheap and superfluous labor, the cheap and abundant capital, and the well established manufactures and business concerns of Europe. The decline of our merchant marine is however more than compensated by the increase of our internal commerce and carrying trade.

While England has only 18,000 miles of railroads the United States has within a fraction 105,000 miles. The value of our railroads is \$6,314,000,000, and their earnings during the last fiscal year amounted to \$725,325,119. Add to these figures our coast, our lake, and our river trade and the showing will be such that the people of this country may well be proud of. The total value of the merchant shipping of Great Britain during the last fiscal year was \$590,000,000 being \$135,325,119 less than the earnings of our railroads alone.

The United States embraces almost a continent, and its internal and coast trade will soon be (if it is not already) more extensive and more valuable than the combined internal and foreign commerce of any other single country in the world.

"Once," but when was our ocean carrying trade "second only in importance to agriculture"? Not since under the present protective system diversified industries have utilized the natural resources and capabilities of our country, and given us unprecedented prosperity and substantial wealth.

Mr. Wells is also seriously concerned about the "over-production" of our manufacturing industries, wants a foreign market for these surplus products, and complains that our protective restrictions deprive us of such market. He does not inform us how these tariff restrictions prevent our manufacturing industries from sending their surplus products to other markets, but in a note to his article he states the fact that the importations into this country during the last fiscal year amounted to \$724,623,000. In the second part of his article on Tariff Revision in the January number of the

Princeton Review for 1883 after showing that in 1881-2 the importation of cotton fabrics amounted to \$34,351,000 he says, "That the tariff has ceased to be a factor of the slightest importance in determining the source of supply of the great bulk of the cotton fabrics required for the domestic consumption of this country, and that American manufacturers would fully control this supply were every tariff enactment at once swept from our statute books; but that, on the other hand the existing tariff and our navigation laws constitute an almost insuperable obstruction to the command, by the same manufacturers, of any other than the domestic market."

Foreign industries, during the last year, saw a good market in the United States but Mr. Wells could only see a market where the \$724,623,000 importations came from. He makes the great mistake of taking the "flooding" of our markets with foreign goods as an evidence of the over-production of our own manufacturing industries; and he does not seem to see that his own facts and figures prove this mistake as clearly as any thing can be proven. It is impossible to understand how Mr. Wells with the figures of last year's excessive importations before him could insist that the dullness of our markets was due to the over-production of home industries. It is equally difficult to understand how a reduction of duties could relieve our over-stocked markets, when his own figures show the fact that this country, even with all the "obstruction" of the present tariff, is a good market for other countries. He ought to see that as long as American industries cannot supply our own markets, as his figures prove, we do not need a market anywhere else. It would be folly to compete for gain in the cheap and overstocked markets of other countries as long as our own is the best market; and it would be worse than folly to open our own markets to free competition in the hope of gaining advantages in foreign markets. We have all the advantages of free competition in these markets now, and a reduction or repeal of our tariff would give us no other advantages and would open no new or better markets.

Mr. Wells shows by statistics from the census of 1880 that in this country the wages of iron and steel workers are not higher than the wages of common labor. He states too that iron masters "allege that there has been no realization of profits above the average, in their business," "it clearly follows" he continues "that protection has ceased to protect either labor or capital in the industries under consideration." If this shows anything it shows that the protected industries of the United States whether labor or capital make no greater profits than other industries, and proves conclusively the error of the favorite argument of writers on free trade, namely, that protection enhances the price of things protected and that therefore the maker of those things gains the increased price, and the user must pay it. If Mr. Wells had kept in view the fact that labor and capital go where they can earn the most—follow the chances of greatest profit—until the earnings or profits in the different industries are equalized the latter part of his argument would not condemn the former. He would not have arrived at the conclusion that the increased price of protected commodities is all gain to the producer and all loss to the consumer; and would have been saved the misfortune of hav-

ing proved by facts of actual experience the error of his own conclusions.

According to Prof. Sumner the problem of political economy is "how to obtain the greatest material good for a given amount of effort or sacrifice." And he argues that free trade is the true solution of this problem—by opening the markets of the world to all and permitting every one to purchase in the lowest. Are the cheapest markets of the world an advantage to us? It is a well known fact that cheap commodities mean cheap labor, and cheap labor means increased effort to obtain a given amount of good." Hence writers on free trade advance a plausible theory about the ratio of the purchasable value of wages, and the price of commodities. This theory however fixes no standard of living, and furnishes no basis for apportioning the wages of labor and the price of commodities, and wholly ignores the laws of supply and demand. The standard of mere living depends upon the wages of labor and the price of things needed, and both these are governed by the laws of supply and demand. But as the laws of supply and demand of most of the necessities of life are not administered by man but by Providence—by the conditions of weather, soil and other circumstances—all theories about the "ratio of wages and prices of things" must of necessity be faulty and worthless.

They are not only worthless but deceptive, for it is a well known fact that when crops are abundant, employment increases, provisions cheapen, and wages advance; and when crops are short, employment diminishes, provisions advance, and wages cheapen. Practically therefore the prices of things needed for living and the wages of labor *do not rise and fall together proportionately but adversely*; and a grade of wages that would afford a mere living when provisions are plenty would lead to starvation when provisions are scarce and high. Cheap labor means cheap living, and cheap living means poor living; and if the labor of this country must come into competition with the cheap labor of other countries, as it would under free trade, then the wages will be reduced to the "verge of poverty" as Prof. Sumner admits is the case in the old countries.

Three fourths of the value of commodities generally is the cost of labor bestowed upon them, and hence in any reduction of prices labor loses three dollars out of every four.

How a reduction of values can add wealth or be of any advantage to production Prof. Sumner's universal science of wealth does not explain. A theory that seeks only cheapness and the advantage of consumption and exchange is not based on a true science of political economy. Advocates of free trade seem to forget that there can be no exchange unless there are commodities to be exchanged. They overlook the fact that production, and not exchange is the source of wealth, and that the producer's rights and interests are entitled to consideration as well as the trader's and consumer's. They do not seem to recognize the fact that the production of commodities finished for use gives them all the intrinsic value they can have, and that the profits of exchange are the advances which necessity and want are compelled to yield.

Exchange creates nothing and adds nothing and therefore cannot produce wealth. It can extort created wealth from necessity, ignorance,

and profligacy. What one country gains by foreign trade another loses. There may be mutual advantages in an exchange of commodities between two countries, having different products, but there can be no gain by either without an equivalent loss to the other.

Free trade would enable us to buy in the cheapest markets, but the cheapest markets fix the standard of values where labor is brought to the "verge of poverty," and where the laborer as Prof. Sumner admits "must work hard and for long hours to gain subsistence." No kind of business, nor any thing that tends to give prosperity to a country can receive any advantage or encouragement from cheapness or a low standard of values. It is "good prices" that stimulate enterprise and industry, and it is enterprise and industry encouraged by the prospects of fair rewards that give prosperity to a country; and when a country is prosperous very few of its people need be on the "verge of poverty"; for all will share to some extent the general prosperity.

But the worst effect of opening this country as a free market for the world would be, that our purchases would exceed our sales, and that the balance of trade would be largely against us. This fact has escaped the notice of Prof. Sumner and Mr. Wells. They seem not to remember that even with the "almost insuperable obstruction of the present protective system" the balance of trade has been at times against us, and that whenever such was the case panics and financial ruin were the inevitable result.

A nation, like an individual, that buys more than it sells runs into debt; and if it consumes what it buys it is impoverished to the extent of that indebtedness. And even if its purchases are not perishable and are not consumed it is still a debtor-nation dependent upon and tributary to the countries from which it buys and to which it is indebted. Balances of trade against this country must be made up in specie or they will remain a debt against its people. If these balances are paid the country will be drained of its specie and business will be paralyzed for want of a sound circulating medium; if they are not paid, debts continue to accumulate, and in either case the result will be financial ruin.

The panic of 1873 should be a sufficient warning for the people of the United States never to allow the balance of trade to be against them hereafter.

LEBANON, PA.

ULTIMATE ELEMENTS AND RESULTANT COMBINATIONS—THE ALPHABET OF THE UNIVERSE.

BY PROF. G. R. HAND.

Ultimate elements, will be used to represent the last analysis of material and immaterial substances, which I shall call the alphabet. Resultant combinations, will represent the audible, visible, and tangible entities wrought out by the significant and definite combination of the ultimate symbols of this alphabet.

God has given us an alphabet in each of the departments of Nature, addressed to the ear, the eye, and the touch, by which we may spell out his design and action, his plan and opera-

tion, in the completed, yet ever progressing and moving panorama, in the machine shop of creation. In each of these three alphabets, I shall regard the letters, or ultimate elements, as real, substantial entities, as their results claim the cognition of our physical senses.

I. SOUND. The phenomena of sound, will constitute my first alphabetic lesson, as a basis of analogy for the next. About forty elementary articulate sounds of the human voice, by numerous combinations, are capable of being wrought into more than one hundred and thirty thousand words, even in the English language. Letters are used to represent sounds, the one addressed to the eye, the other to the ear. These combined into words represent thoughts, and the further combination into sentences, paragraphs, essays, &c., presents the reasoning upon these thoughts, until a stream of intelligence, in visible and audible form, is rolled out upon the world.

These letters are substantial entities, visible and tangible, and may not the sounds they represent be also real entities, substantial emanations? We can conceive of them as immaterial substances passing from the sonorous body to the ear. Now conceive of the thoughts conveyed by these sounds, as real entities, the media between real entities, and of a "more enduring substance" than mere "modes of motion," and destined to be stored in the department of realism, in the great treasure house of eternity, to the credit of those from whom they emanated. "For by thy words thou shalt be justified, and by thy words thou shalt be condemned." Mat. 12:37.

The department of music furnishes us a fine illustration of a great variety of sonorous sounds combining into melody, rich as the nightingale's song, and swelling into harmony as the grand old anthem rolls out upon the enraptured ears of the enchanted multitude, in voluptuous praise to the Author of Nature.

We pause in the grove and drink in one draught of rich melody wafted from the throats of the feathered songsters as each seems to vie with others in vocalizing the air with songs of thanksgiving.

That was rather a beautiful thought, that all the sounds in the world combined, would constitute the harmony of Nature.

II. MATERIAL SUBSTANCES, AND PHYSICAL ORGANISMS. Decomposing and analyzing the various forms of organic and inorganic matter, the chemist has discovered about sixty-four primary elements, which, in its present status, may be called the ultimate analysis. Thus God has given us sixty-four letters with which to spell out the visible and tangible forms in the physical universe.

The certainty with which a definite combination of the letters or sounds of the alphabet, produce a given word, is even excelled by the certainty with which the letters in the physical alphabet, combined in definite proportions, will spell out the required substances. Chemical affinity is very exacting in its demands, and is a very accurate speller. The child just learning to spell, must look at every letter separately before he can pronounce the word, but the well trained reader takes in a whole word and even a whole line at a glance, and his practiced eye will even detect an error in the chirography of a single word. So the chemist, having ascertained the definite combination of atoms in a given form or substance,

reads the same combination, in like forms the world over.

Take a lesson in the mineral kingdom. The elements that form limestone or marble in one country, will form the same in any other, and so of all the rocks.

The mineralogy of one country compared with that of any other will be spelled out just alike, by the retort and crucible, in the chemical laboratory, and by the present nomenclature, will be labeled with the same symbols.

The chemist, lecturing on chemical affinity and chemical equivalents, takes as ultimate elements, chlorine and mercury, and says: "Ladies and gentlemen in this proportion, the resultant combination will be calomel." He combines them in that definite proportion, and the fine white powder is forthcoming. The same experiment repeated a thousand times would infallibly show the same result.

He changes the proportion of the elements, and says: "Ladies and gentlemen, in this proportion, the same elements will produce corrosive sublimate." Though not a prophet nor the son of a prophet, the result is just as he predicted, because, "the law of the Lord is perfect," in chemical affinity.

He next takes two tumblers, and pours nitric acid into one, and muriatic acid into the other, and suspends a piece of gold leaf in each, and says: "Ladies and gentlemen, neither of these acids will dissolve gold." After lecturing a while, he holds up both tumblers, to the audience, and the bright gold leaf shows no chemical action. He then pours the contents of one glass into the other, saying: "Ladies and gentlemen, the combination of these two acids, will form nitro-muriatic acid which has the power to dissolve gold, of which you will soon have ocular demonstration by the disappearance of these pieces of gold leaf." After talking a while, he exhibits the glass, in which the gold leaf has disappeared, having dissolved and mingled with the acid. Thus the letters of the physical alphabet spell accurately.

Water, from the arctics or tropics, from Greenland's icy mountains, or India's coral strand, contains the oxygen and hydrogen in uniform definite proportions. You may freeze it, and melt it, and turn it to steam, and the proportions of hydrogen and oxygen remain unchanged. You may pass the steam through an iron tube heated in a furnace, and decompose it, and fill a balloon with the liberated hydrogen. Then again you may take the pure hydrogen and burn it in the compound blowpipe with oxygen, and they will combine and form water of the same proportional compound as before. So it would seem that the mutual affection of oxygen and hydrogen is unchanging, and undying.

The proportion of oxygen and nitrogen composing the atmosphere, is uniform and unvarying, whether found in specimens brought from the sunny South, or the frigid North, from deepest valleys, or Alpine heights, from its compression on ocean's level, or its rarefaction at the highest point to which balloon has ever ascended.

We pass to the vegetable kingdom and find the like uniformity. The grass, the shrubs, the trees, in all their varieties, have their uniform plans and measures, and uniform work allotted them. In the absorption and appropriation of his carbon, the majestic oak, though

monarch of the forest, never mistakes and appropriates to himself the rule and apportionment by which his neighbor of another species works. In the vegetable culinary department, in the confection of delicious fruits, the apple, pear, peach, &c., compound their confectionaries, with as much accuracy, and uniformity as does the pastry cook.

And then in the flower garden the proportions for each variety are dealt with an unerring skill, that is strongly suggestive of intelligence. The rules for the distribution and appropriation of the ultimate elements, in vegetable and floral architecture, are as definite as in the arrangement of letters in written language.

Passing up to the animal kingdom, we find the same constructive alphabet, furnishing us some of its letters, with which to spell out all the myriads of forms in animated Nature. The thousands of forms with which animal life is clothed, are the resultant combinations of only about one fourth of the letters of our original physical alphabet, arranged in one endless variety of proportions and organic structures.

Organism is a process that defies the skill of the chemist. He can decompose and recompose inorganic substances. He can deorganize both vegetable and animal organisms, but their reorganization, like a coy dame, trusts not herself to the manipulations of the laboratory. Man may combine the same elements, in the same proportion, but organism will not result, and the failure shows that "spontaneous generation" has been all this time pursuing a cold trail.

Coming up to man, we find a beautiful form so "fearfully and wonderfully made," spelled out by the definite arrangement of a few of the letters of our physical alphabet, a resultant combination of ultimate elements in organic union, fit tabernacle for the habitation of a human spirit. Then think of the spirit as a reality, of immaterial substance, inhabiting and superintending the building and repairs of its own material dwelling, by the accurate and definite arrangement of the elements, and the letters strangely spell out, and the mind intuitively pronounces, the Godlike thought: "Creative intelligence," and "Nearer my God to Thee," seems transferred from the kingdom of grace, into the kingdom of Nature.

III. LIGHT. Cognition of external objects by the sense of sight, claims the medium of light. And here again God has given us an alphabet. The seven prismatic colors, revealed in the analysis of the solar spectrum, furnish us the alphabet. These by various arrangements, and combinations, and comminglings, present to the eye the rainbow, the starry heavens, the beautiful landscape, the variegated foliage, the many tinted flowers, and "the human face divine." The artist having studied his luminous alphabet combines his colors, and shades of colors, and tints and semi-tints, until he feasts the eye with the beautiful harmony of colors; and visual anthems charm the eye as beauty personified, and artistically arranged in captivating groups, beams down upon you from the ornamented walls of the art gallery. The primary visual alphabet may be studied in the rainbow. And strangely enough, this whole alphabet combined spells white light, or the light of the sun, while their entire absence leaves blackness or darkness, which is no color at all.

We can conceive of light as a real substance, as it emanates from real substances, and is reflected from real substances. The arrangement of physical elements in the flowers, causes the reflection of different colors. So the artist uses substances to reflect the tints in the picture on his canvass.

In all these departments we have been recognizing realism or Substantialism. And possibly the nebulous realms of idealism may merge into the golden reservoir of realism, and idealism be swallowed up in reality.

* RICHMOND, MO.

FREEDOM OF THE WILL AND FOREKNOWLEDGE.

BY PROF. I. L. KEPHART, A. M.

In my last article it was maintained that the freedom of the will and the *certainty* of the future choices and acts of probationers are necessarily and absolutely incompatible. This is so because in the very apt words of Julius Müller, "character, in its earthly growth, is never so fixed and certain as to be unsusceptible of new and different determinations from the inexhaustible source and depth of free will, which can sever the threads and introduce new ones." The question now arises: How can even the Omniscient God have foreknown from all eternity, as a *certainty*, the future choices and acts, and consequent final destiny, of those whom he has endowed with free will, placed in a state of probation, and in which state, by their own free choices and acts, they establish their character and determine their destiny? That the theology of both Calvinists and Arminians, teaches that God does now know, and has from all eternity foreknown all future choices and acts, and, consequently, the final destiny of each and every free moral agent or probationer, will not, I think, be denied by any one. And it is attempted to reconcile free will with this foreknowledge by contending, as does Dr. Gregory in the paragraph quoted in my last article, that true freedom of action is not inconsistent with the certainty of the actions of probationers. But, as I have surely shown that his assumption is false and that the argument with which he seeks to establish it is illogical and utterly fails to establish his position, must we not conclude that the dogma of absolute foreknowledge is false?

According to this dogma, God knew when Judas was an innocent babe in the cradle, aye, from all eternity, that in the exercise of his free will, he would certainly become covetous and yield to his love of money so far as to betray his Divine Master, and thereby sink himself into an endless, awful hell. ("It were good for that man if he had not been born.") Why then, did He not interpose and remove from the cradle to the grave this then innocent babe, foreknown to be certain of thrusting himself into endless perdition by basely betraying his Lord if permitted to live to become a man? If it be answered that Christ's betrayal by Judas was an essential part of the atonement, then why damn him for performing that essential part? If the betrayal of Christ was an essential part of man's redemption and God knew as a certainty when creating Judas that he would perform that essential part, then, in perform-

ing it, Judas was as truly doing God's will and contributing to the establishing of Christ's kingdom in the world as were Peter and the other apostles when preaching Christ and the resurrection; and to damn him for performing an act which his Creator knew as a certainty when creating him, and the doing of which was essential to man's redemption, would be an act of cruelty and injustice which none but a devil could perpetrate. And yet, the dogma of absolute foreknowledge would have us believe that the infinitely just and merciful God has done that very thing under exactly those circumstances. And as in the case of Judas, so in the case of every finally impenitent sinner. In case he Almighty knows when such are in the cradle that, if permitted to attain to accountability they will commit sin and be damned forever, His justice, goodness and mercy all unite in demanding that He interpose and remove such from the cradle to the grave, even if such removal were to involve their annihilation; for as, "it were good for that man if he had not been born," we conclude that annihilation or non-existence is preferable to everlasting damnation. Aye, these divine attributes demand, in each case where the Omnipotent God knows as a certainty that if He create a soul such soul will be lost forever, that He peremptorily refuse to give existence to such. For a kind-hearted, humane earthly parent to stand by and witness infinite power and infinite wisdom arbitrarily bringing into existence a human soul, knowing certainly at the same time that it will be wicked, wretched and forever miserable, would cause such a parent to shudder with horror at the terrible act. But the dogma of absolute foreknowledge requires us to believe that "the Lord, the Lord God, slow to anger; plentious in mercy, who delighteth not in the death of any but would that all would turn unto him and live," deliberately does such a monstrous thing.

As said by Joseph Cook, "sin exists by reason of the *abuse* of free will." "Sin is the transgression of the law." It is rebellion against God. It is that upon which God cannot look with the least degree of allowance. Therefore we must conclude that if it had been possible for Him to create free moral agents,—beings capable of virtue, capable of creating characters for themselves, capable of appreciating and adoring the matchless goodness, wisdom, justice and mercy of their Creator, and being fit companions for Him—and still prevent the introduction of sin into the universe, He surely would never have permitted sin to exist. But it was not possible for Him to endow beings with free will so as to be capable of virtue without making it possible for them to *abuse* it and introduce sin into His universe. To such God could not *give* a moral character, for "*moral character is*" (and in the very nature of things can only be) "*the result of freely volitionating in harmony with the standard of immutable rightness.*" He could only establish the conditions and surround them with the circumstances under which it is possible for them to *create* a moral character for themselves. In this sense every being endowed with free will is a creator, and is in the image of his Maker.

Now, until such, by their own free choices and acts, have created or established their moral character they are, and in the very nature of things must be in a state of probation. But

probation necessarily implies temptation, trial. "Any theatre where vice has no attractions and virtue no difficulties, could not afford a legitimate arena for the achievement of moral character." And, as Dr. Gregory says that it is only when all temptation to do the wrong is removed that it is *certain* that the good man will in any given case do right, it cannot, as already shown, be *certain* what the choices and acts of such probationers will be until they, in the exercise of their sovereign free will, by choosing and acting, have made it certain. Hence, because it was in the nature of things, impossible for the Omnipotent One to create beings capable of virtue and absolutely prevent the introduction of sin into the universe by the abuse of free will, and because in His infinite wisdom He saw that it was better to create such beings even at the risk of sin being introduced into the universe (well knowing that His wisdom and power were more than equal to any emergency that might arise out of the introduction of sin by the *abuse* of free will), therefore He did create free beings who have introduced sin into God's universe. Into the hands of those beings the determining of their own destiny was of necessity placed. While to them is committed, in their probation, the high prerogative of developing a character in complete harmony with God's will and thereby fixing for themselves a destiny of infinite happiness, at the same time there is of necessity, given to them the power to array themselves against their Creator and thereby seal their doom for endless woe. His destiny is of necessity placed at the disposal of each individual soul. God can and does urge and persuade (a thing that He would not do if He knew as *certain*, each one's destiny already), but He cannot coerce a free will in matters that determine and fix moral character and final destiny, any more than He can make righteousness a curse or sin a blessing. He cannot, by force, constrain the love or prevent the hate of a free being. But, as sin is so obnoxious to Him, and as its consequences to His children are so terrible, we must conclude that, could He, before creating such souls as are finally lost, certainly know what their final destiny would be if created, He would not give existence to such.—He would only give existence to such as He knew would do His will and be happy. The teaching that God voluntarily brings into existence human souls, knowing *certainly*, and *beyond the possibility of its being otherwise*, that they will writhe in hell forever, has made and is now making more infidels than all the books that Paine, Voltaire and the whole infidel hoard have ever written; and until the churches so change their theologies as to rid them of this damning blot they might almost as well close their doors. In these days of enlightenment an eschatology is demanded that will stand the test of sound logic, actual justice and goodness, and plain, practical common sense.

A QUEER CASE OF VIBRATION.

SINGULAR EFFECT UPON THE HUMAN BODY OF A GREAT WATERFALL.

THE Boston *Advertiser* says that it has been well known for many years that when a body of troops crosses a bridge the step must be broken, otherwise the regular tread of such a

heavy weight of men will throw the structure into vibration so violent as to endanger its standing. It is also well-known, though it has not been fully established until recent years, that large buildings have their key-note, and that factories standing near dams have been put into such vibration by the quivering of the falling water that they have seemed in actual danger of destruction, so violent has been the oscillatory motion. When the water has subsided the motion has ceased. The explanation is that the particular volume and velocity of the water struck the key-note of the building, and set it in sympathetic vibration. It has been held by some that there is a particular key to the sounds of Nature, and the hum of city streets has even been fixed by some upon the key of F. So much by way of preliminary is necessary to a ready understanding of the remarkable story narrated below. During one of the numerous floods which occurred just after the recent protracted drouth in Northern New Hampshire and Vermont, one of the watchmen of a large factory near a high head of water went up to the cupola to get a good view of the rising freshet. He was an unusually firmly built man, young, elastic and vigorous. In stature he was five feet and ten inches in his stockings, and his weight was 180 pounds—just the length and weight to vibrate to the key of G. It was late in the afternoon, but not time for him to go on duty for the night. His sleep in the forenoon had been disturbed, and so, after watching the water for a time and becoming satisfied that there was no immediate danger, he dropped into a plain pine chair, and in a few minutes was fast asleep.

But while he slept the water rose. It was about eighteen inches deep on the dam, and the broad sheet that poured down was in a visible quiver from end to end from its own vibration and that of the volume of air behind it. It was just the vibration to strike the key-note of the factory. A tremor began to be felt even to the foundation. In the fourth story it was disagreeably strong, and in the cupola was even violent. It awoke the watchman, and he found himself under its influence. In every part of his body he felt the peculiar motion. A numbness and lack of power to control his muscles overcame him. He knew not the fatal influence which seemed to hold him resistlessly; but the truth was that his key-note was exactly the same as that of the factory, and his closely-knit body was vibrating many times a second in unison with the building. No sound was yet audible from the vibration, but as the tremor became stronger it seized upon his vocal cords and set them in motion.

Frightened and desperate, he made a determined effort to free himself. He struggled to rise from his chair, but could not command his muscles. He opened his mouth to scream, but emitted, instead, a prolonged sonorous note of his fundamental pitch. This sealed his doom. It was a fatal error, caused by his lack of scientific knowledge and forethought. Up to this time the vibration had siezed upon his vocal cords only, but this strong note, added to the quivering of the mill, which was of itself on the point of taking entire possession of him, threw his whole body into vibration, violent and uncontrollable. His vocal cords would no longer emit any sound whatever. His whole

body began to hum; like the hot bars of singing silver explained in a recent Lowell Institute lecture, the entire man vibrated so intensely and rapidly as to make a singing sound, and his voice was incapable of separate action. His fingers trembled so that they had an uncertain boundary, like the edge of a buzz saw. His head quivered violently; his feet were not to be clearly seen. The inevitable consequences followed. Human flesh could not endure the strain. It broke at the ends of the fingers; blood oozed out. The nose and ear-tips became blood-shot. The encasing boots were not strong enough to protect the feet. Gradually all the extremities became frayed out, like a flag flapping in a gale. The large blood vessels were in turn exposed and ruptured. With the increasing loss of blood, and utterly helpless to move or cry, the poor watchman succumbed to his fate. He fell upon the floor, and, weltering in a pool of blood, gradually lost consciousness. Life could not long remain, and, though the flood subsided within two hours so that vibration ceased, yet the relief came too late. The unfortunate man was found dead the next morning, and no one at the time could explain the cause. The coroner's jury returned a verdict that he came to his death by causes to them unknown. If any moral is to be drawn from this hitherto unknown calamity, it is the danger of singing too much in one key, and if anything can teach the moral with vivid force "experientia does it."

REMARKS ON THE FOREGOING.

We print this statement as it has been going the rounds of the press and which has been sent to us by different correspondents for our criticism, as a specimen of the stuff that passes for science with respectable newspapers. We marvel that any one capable of reasoning scientifically could be led to believe that there was the slightest degree of truth or rationality in this silly milldam story, including the manner of the death of the watchman. The whole thing is a pure and simple work of the imagination, without ingenuity enough on the part of its inventor to make the fiction hang together.

The plot is laid at a "large factory," which is of course as near as such stupid fabrications generally dare come to locality in order to escape exposure. But the worst part of the fraud is its ridiculous details, so impossible, yet which agree so well with current science. The whole thing exposes itself as a marvel of stupidity. The inventor narrates the man's visit to "the cupola"; his "watching the rising freshet" for some time and thinking there was "no immediate danger"; his sitting down and going "fast asleep" his awaking with the vibrating effect: his feeling a "peculiar motion" in "every part of his body," and "numbness and lack of power to control his muscles"; then his height,—"five feet ten inches in his stockings," and his weight "180 pounds,"—being "just the length and weight to vibrate to the key of G"! Then we learn how this sonorous 180-pound man "knew not the fatal influence which seemed to hold him resistlessly," till his "key-note" of "G" was struck by the unisonant milldam, when his "vocal organs" were seized upon and set in motion; and then the man was "frightened"; tried to "free himself"—"struggled to rise"—"opened his mouth to scream," and emitted a long "sonorous note of

his fundamental pitch," which of course was that same "G" since that was his "key-note"; and this "prolonged sonorous note" "added to the quivering of the mill," which "threw his whole body into vibration violent and uncontrollable";—then "his whole body began to hum" so as "to make a singing sound", while "his fingers trembled so that they had an uncertain boundary", his "head quivered violently", and a lot of other phenomena, too tedious to repeat, then and there took place! But here comes the self-exposure of the bungling narrative, as the man was all this time entirely alone, with no one to witness anything connected with his death or its cause, for "the unfortunate man was found dead the next morning"! Query: How did the scientific crank who concocted this story with such remarkable "scientific knowledge and forethought" learn all the details about this man's remarkably complex experiences in that cupola, when no one knew of his death and when "the coroner's jury returned a verdict that he came to his death by causes to them unknown"? Yet our cranky romancer knows all about it because these superlatively nonsensical imaginings happen to be in harmony with the modern teachings of acoustical science! It really seems strange that intelligent men will read and wonder over such puerile stuff as this, and be gulled to believe that it contains more than a dust of scientific truth, while ninety-nine hundredths of the miserable mother-goose story is a clumsily constructed hoax. It is in fact the same kind of science that teaches, as does Prof. Tyndall, that the *sound* of a magazine explosion is what destroys buildings, kills men and animals, etc. Of course the way this magazine *tone* kills a man at such explosion is to strike his "key-note" with a "singing sound" and make him "hum" himself to fragments, scattering them over acres of ground! What pitiable nonsense! Really a physicist who can thus totally ignore the gas generated and added to the atmosphere at a powder explosion, and then seriously attribute its destructive effects to the accompanying *sound* which, *per se*, was never known to stir a feather not tuned in unison to its pitch of tone, should take one more step and ignore the lightning bolt as the *cause* of the destruction of a tree, and coolly teach that it was the *thunder* that did the damage, by finding its "key-note" and *buzzing* it to pieces! It is a positive fact that a lecturer recently went through the country seriously urging that, according to acoustical science no one need be afraid of lightning, since the damage was all the result of the thunder! Of course he was right if there is any truth in the wave-theory.

HOW IT WORKS.

Dr. Hall: I have been an admirer of your writings from the beginning, and I drop you this to chronicle a fact in passing events. I have just closed a discussion with Prof. John E. Remsburg, agnostic infidel, and a lecturer of rising fame among the liberal leagues of this country. Said debate was held at Carbon, Clay Co., Ind., from the 7th to the 11th, inclusive of the present month. In no way could I provoke him to attack Substantialism. I am sure that we are on the right road to the har-

mony of all true science with the Bible. This boasted lecturer, whose praise is in all the free thought papers of the West, relied upon statistics of criminality in Christian lands and assumed contradictions in the biblical record, but was silent as the grave when shot from fort Substantialism were playing through the rigging of self-styled scientific infidelity. So mote it be! In the faith yours,
Bloomington, Ind. W. B. F. TREAT.

TYMPANIC VIBRATION AND THE WAVE-THEORY MUST STAND OR FALL TOGETHER.

D. A. POST, M. D.

A. WILFORD HALL, PH. D.

Dear Sir: The arguments in the *Problem and Microcosm* against the wave-theory of sound seem unanswerable, yet every well authenticated case that can be produced to let in the light of truth upon the subject of acoustics should be given to the public. Allow me therefore to call the attention of the readers of your valuable journal to the case examined by Sir. Astley Cooper, the most eminent surgeon of his time, reported in the 1st volume of Dunglison's *Physiology*, Page 163, Edition 1841.

"Sir Astley was consulted by a gentleman who had been attacked by an inflammation of his left ear which continued for several weeks. After twelve months, the same symptoms occurred in the right ear; in consequence of these attacks he became deaf and remained so for several months. The hearing began to return and in about ten months from the last attack he was restored to the state he was in when Sir Astley examined him.

"Having filled his mouth with air he closed his nostrils and contracted his cheeks, the air thus compressed was heard to rush through the *meatus-auditorius* with a whistling noise, and the hair hanging from the temples became agitated by the current of air that issued from the ear, when a candle was applied the flame was agitated in a similar manner. Sir Astley passed a probe into *each* ear, and thought the membrane of the left side *totally* destroyed, as the probe struck against the petrous-portion of the temporal bone. The space usually occupied by the *membrane tympani* was found to be an opening or aperture without *one trace* remaining. On the other or right side also a probe could be passed into the cavity of the tympanum through an opening one quarter of an inch in diameter in the center of the tympanic membrane. Yet this gentleman was not only capable of hearing everything that was said in company but was nicely susceptible of musical tones, he played well on the flute and had frequently borne a part in concert and he sang with much taste and perfectly in tune."

Query—If the wave-theory of sound is true, how could Sir Astley's patient hear so perfectly?

Is not the *vibration* of the tympanic membrane as essential to that hypothesis as the *sonorous wave itself*?

As both membranes in this case were undoubtedly destroyed, will some *undulatory* gentleman account for the sensation of sound in this man?

YPSILANTI, MICH.

REMARKS ON THE FOREGOING.

Plainly, Doctor Post is right. There is no use for the wave-theory in acoustics if the hypothesis of tympanic vibration breaks down. And of course it breaks down from many considerations outside of the fatal fact he refers to—the entire absence of any such membrane, with hearing still perfect. We gave numerous proofs during last volume going to show that the tympanic membrane was not adapted nor intended to vibrate by sound—was not in fact a stretched membrane at all—that it was a mere flaccid mass of tendinous fiber designed to protect the inner organs of hearing from the effects of too intense sounds, and from foreign matter, as also to distribute the sound corpuscles so as to make them more effective in producing intelligible sonorous sensations. The absence of both membranes however is the conclusive proof that tympanic vibration as the means of hearing sound is a cardinal fallacy, and that the wave-theory based upon it is a superstructure without a foundation,—a veritable castle in the air! The Doctor is right. They stand or fall together, and as tympanic vibration has absolutely fallen, *the wave-theory must go*.

ELASTIC ACTION.

BY REV. PROF. S. B. GOODENOW.

A striking body imparts such part of its momentum, as is expressed by the mass of the body struck compared with the mass of both bodies, if they be non-elastic; but gives just as much more of elastic action, if the bodies be perfectly elastic. Thus, with masses 1, 2, 3, 4, 5, &c., striking mass 1, we have 1-2, 1-3, 1-4, 1-5, 1-6, of the striking momentum imparted, or 2-2, 2-3, 2-4, 2-5, 2-6, with perfect elastic action included.

Therefore, with non-elastic bodies, masses 1, 2, 3, 4, 5, give to mass 1 struck a *velocity* 1-2, 2-3, 3-4, 4-5, 5-6, or just the same as their own; with elastic bodies, just as much move *ahead*, or 2-2, 4-3, 6-4, 8-5, 10-6, in all. And increasing "the bat" or decreasing "the ball" to infinity, can give *only double* the velocity of stroke to the ball struck; and a less increase in proportion.

The mistake of Prof. Comstock (in the *Microcosm*, July, p 376,) is in supposing the body striking to impart (and so lose) *all* its momentum. If so, it would stop at rest, while the body struck would take all the momentum forward; but this occurs only when the bodies are *equal*, as in the experiment with ivory balls. Surely, a cannon ball striking a pea, does not impart all its momentum and come to rest; and therefore the pea does not go forward with all that momentum acquired, but only a small part of it. In Prof. C's example, a bat 16 times the mass of the ball, can impart only 1-17 directly and by elastic action 1-17 more of its own momentum and 16 times this or 32-17 of its own speed; *i. e.*, 32-17 of 50, or 94 feet, instead of 800 feet, as given by Prof. C.

The reason, why a striking mass sixteen times the mass struck gives an elastic action only one seventeenth of its own momentum; (thus only doubling the momentum directly imparted,) is, because the *inertia* or resistance of the ball struck, which is only in proportion to its mass, is what enables the stroke to make

the indentation causing the elastic action (and re-action;) so that the indentation, and consequent elastic action, can only be in proportion to the mass of the elastic body struck.

With this truth accords Dr. Hall's argument, (July p 337, end;) where the only error is, in speaking of "momentum or rate of travel" as if the two were the same, so that less momentum is made to necessitate *less velocity*. Whereas, the less momentum of the struck ball, being caused by its less mass, leaves its velocity or rate of travel ahead (derived from elastic action) the same added value, always equal to and doubling the distance that would be attained without elasticity.

Hence, though the struck mass be reduced even to a single particle of air, so long as it is matter and has inertia, a solid blow given it will send it forward twice as fast as if it were non-elastic, and only twice as far as the body striking would go, whatever its size, (supposing no obstruction from other particles as is not the case.) Suppose the particle struck to be one-millionth as much as the mass striking it. Then direct impartation gives it 1-1,000,001 the momentum, or 1,000,000-1,000,001 the motion, which elastic action will double to 2-1,000,001 the momentum or 2,000,000-1,000,001 the motion; that is, about twice as much as the striking momentum and motion. And so in every case.

Thus, though the illustration of Prof. Comstock has an error, not showing what he wrongly alleges, "that a body moving with moderate velocity may impart *great* [he should say *double*] velocity";—yet it may serve his purpose so far as to show, that velocity is increased *somewhat* in passing to an elastic mass, like the quiver of a piano-string passing to elastic particles of air. The touch on the key throwing the hammer far against that string, would be a better illustration of increased velocity imparted to less mass,—a common principle of mechanics.

But how does the discussion bear at all on the rapidity of sound-waves passing through the air? It is not pretended by the wave-theory of sound, that air or any substance is thrown or made to move with any great *velocity*, or any faster or farther (it may be) than the sonorous string or prong itself moves. All the claim is, that a shove and pull of the air here, gives it a shove and pull all the way to the ear far off there, with very little delay; even as juggling one end of a long pole gives the same motion to the other end, without lapse of time, and *no special velocity of travel*. It is this aspect of the matter that needs to be discussed.

BATTLE CREEK, IOWA.

REMARKS ON THE FOREGOING.

We have only one criticism to offer on Prof. Goodenow's highly scientific paper, and that is upon the following sentence which we quote:—

"Hence, though the struck mass be reduced even to a single particle of air, so long as it is matter and has inertia, a *solid blow given it will send it forward twice as fast as if it were non-elastic.*" &c.

We think an important qualifying factor is entirely left out of this statement. It depends, as we think, largely upon the velocity of the striking body even if the struck body were perfectly elastic, as to how much faster it would travel than it would if non-elastic. Manifestly

the striking body might move with so little velocity and thus overcome the inertia of the struck mass so gradually as not to compress it or bring its elasticity into play, or at any rate not sufficiently to make it separate from actual contact with the striking body as it continues to move forward. How, then, in such case, could the elastic mass, move away "twice as fast as if it were non-elastic" when it does not move away from the striking body at all? For example if a vibrating prong should travel while sounding, as we know it can, only at the rate of *one inch* in a second, its contact with a suspended rubber ball would not indent it enough to cause it to react and separate itself from actual contact with this slowly moving prong, but would travel along in contact with it just the same as would a perfectly non-elastic mass of the same weight. Neither would a ball of air of the same size, if it could be kept intact in a vacuum, leave such slowly moving prong, since it has still less inertia to induce indentation and thus bring into play its elasticity. Of course then it follows, that the swifter the striking body moves the greater will be the proportionate indenting force, and the more in proportion will be the reactive bound of the elastic over that of the non-elastic body. It follows therefore that with a very slow blow or contact no forward movement of the most elastic struck body in the world would take place any further than the striking body would push it. The same precisely would be the case with a non-elastic body. Hence Prof. Goodenow must qualify his statement and name some exact velocity of blow that would result in giving the elastic mass "twice" the velocity of the striking body.

Our argument against the wave-theory of sound is thus reinforced by correcting Prof. Goodenow's oversight, namely, that the very slow motion of a prong, even when sounding audibly, will not compress the air at all, much less send off a condensed pulse at the rate sound is known to travel,—namely 1120 feet in a second at 60° F. We know of no greater absurdity in so-called science than that enunciated by Prof. Mayer in his article on sound in The Am. Encyclopedia as follows:

"If air were incompressible, a motion produced at any point of its mass would instantaneously be transmitted to every other point of the atmosphere. Thus, if we imagine a tube open at one end and closed at the other by a piston that moves in the tube without friction, it is evident that if this piston were pushed into the tube a certain distance the air would at the same time move out of the tube at the open end. But air is compressible and elastic, and after the piston has been pushed into the cylinder, a measurable interval of time will have elapsed before the air would move out of the open end of the tube. *This interval is the time taken by sound to travel the length of the tube.*"

He thus makes the result, as to the velocity with which the condensed pulse will travel through the tube, exactly the same (1120 feet in a second) whether the piston is driven instantaneously 12 inches or only one-eighth of an inch. Manifestly a sudden push of only an eighth of an inch but a very weak atmospheric spring would be generated. Is it likely; is it either sense, or science, or true philosophy, that such a weak spring would drive the air

out of the far end of the tube as quick as if the piston were instantly driven in one foot thus generating a spring of nearly a hundred times as much power to act on the air in front? Prof. Mayer, in strict accordance with the wave-theory, teaches, as just quoted, that there would be no difference in the two results, any shove of the piston great or small sending the condensed pulse exactly at the velocity of sound—1120 feet in a second. We appeal to professors and students of science throughout the world to say whether or not we are right in opposing a theory necessarily based on such science as this. (See this question exhaustively discussed in the *Problem of Human Life*, pp. 106, 107, and onward.)

THE WAVE-THEORY'S BEST EXPERIMENTS.—No. 1.

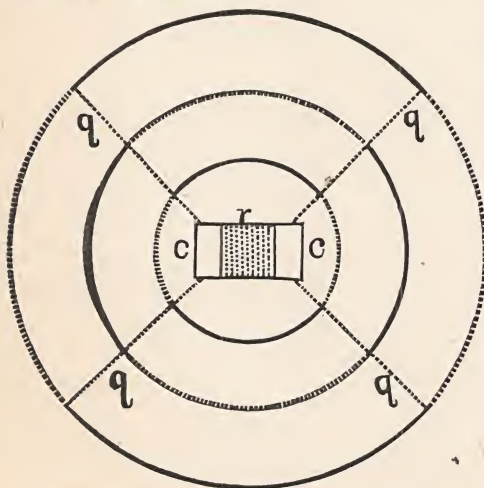
THE TUNING-FORK HELD CORNERWISE.

BY CAPT. R. KELSO CARTER.

We always like to give our adversary the advantage of his resources to the fullest extent, and therefore we take great pleasure in presenting the adherents of the wave-theory of sound with a full discussion of the two experiments which appear to be unexplainable upon any other ground.

Perhaps they do not know it, but it is a fact that the hardest things to explain, except by the wave-theory, are the Chladni Plates, and the fact that a tuning-fork held at a certain angle to the ear, or over a resonant tube, loses so much of its sound as to be actually silent, according to Tyndall *et al.*

After our education in the *Problem of Human Life* we were ready some time ago to demolish every experiment mentioned in the books and give the proper explanation in most cases, but these two were puzzling. We now propose to make them so plain that the merest beginner in science can understand. Let us first take up the tuning-fork.



The above diagram is from the November number of the *Microcosm*, and was used to show the inherent absurdity of the "interference" theory. It will do good service again.

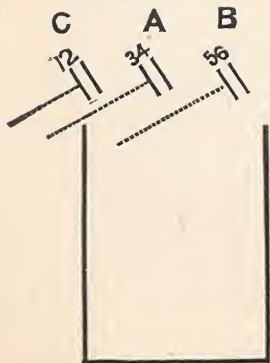
Now it is a matter of fact that when the face, C, of the prong is held toward the ear, the

sound is loudest; when the side, R, is held toward the ear the sound is not so loud, and when the edge is turned so that the ear is on the line, Q, the sound diminishes considerably, though never reaching absolute silence as claimed by the wave-theorists. They would have us understand that the sound is equally loud from C and R, whereas there is a marked difference. I have tried the experiment and found that the C fork of 256 vibrations could be heard *nearly twice as far*, when held so that the face, C, was in the direction of the listener, as when the side, R, was turned towards him. The simple explanation of this is that *sound is conducted by the air much better in a straight line from the sounding body or in the direction of the vibration of that body*. Let wave-theorists stick a pin here. These gentlemen say that when one prong of a sounding fork is covered by a tube, the reason of the marked increase of sound is found in the fact that the tube prevents any interference between the two prongs. In our November article we clearly demolished this shallow artifice, but we have several nails for its coffin. The first is that in the nature of the case there ought to be no interference of the kind claimed by Tyndall and Mayer. Because the two prongs swing out and in exactly together, it is manifest that they must be producing extra condensed and extra rarefied pulses between them all the time in alternation, hence we should hear a swelling of the sound followed by a decrease, but such is not the case. We showed in November how a flat card held between the prongs clearly proved that the tube did not stop any interference, but simply added its own resonance to the sound of the fork. We will now drive nail number two. I laid a tin tube on a plate of bronze, and then inserted in the tube one prong of a large fork, so that the fork embraced the side of the tube and the plate as well. The sound was very much increased. Sliding the tube out of the way, thus leaving the plate alone between the prongs, at once all the increase was lost. The plate makes absolutely no difference whatever. Now we will drive nail number three. I placed *both* prongs of the fork in a large tube and found, that when not more than one third the length of the prongs was in the tube, the sound was increased very materially. How will the wave-theory meet this? Nail number four: I obtained a fork (?) with *one prong* that is I had a flat bar of steel prepared of the same general dimensions as one prong of any C fork. This I fastened in a heavy vise and proceeded to try it. Manifestly there could be no "interference" in this case. To secure *lengthened* vibration with such a bar, a vise is needed of such weight and power as to hold it with absolute rigidity. With this bar I found that the sound was clearly increased when I slid a tube over it, thus demonstrating that the resonance of the air in the tube was the sole cause of the increase. Nail number five. Happening to see a plain iron rod about four feet long, I held it by the middle between my finger and thumb, and then struck one end a sharp blow with a hammer. A deep humming note rewarded me, and at once sliding one vibrating end into a tube I obtained the same marked increase of sound. In this case the increase was audibly supplied *from the tube end of the straight bar* and not from the other end. There will be some difficulty in unfastening that nail.

I will here notice a few curious facts. When a round tube is used, the single prong inserted in the tube secures greater resonance than when both prongs are partly inserted; but when I used the fine resonant box belonging to the fork, the exact reverse was the case, the sound obtained by inserting both prongs being *very much* louder, than when one only was placed within. Again when both prongs of the fork are inserted in any kind of a tube, or when the *two prongs are placed in two tubes held close together*, if the fork is pushed all the way in, the sound is so nearly extinguished that I presume Prof. Tyndall might claim silence, were it not for the fact that this would not be of any use to the wave-theory. *I invite special attention here.* Both prongs in the same tube thus, might be claimed as an evidence of interference of the two; but each prong in a separate tube, giving *precisely the same results*, completely upsets any such theory, for there can be *no interference here of waves, or even of substantial sound pulses.*

When a fork stands on its resonant box and is strongly bowed, a tube slipped over either prong, or over both, makes no appreciable difference. But if when slipped over both, it is allowed to touch the box, at once the sound is increased. But this is not the case when the tube is placed on the box so as not to enclose the fork. These are very curious facts, and are mentioned simply as samples of the perplexing phenomena which meet the candid investigator at every turn.

But now for an explanation. We propose to present the plain truth with reference to the fork's loss of sound, when held at an angle to the ear or over a resonant box or tube. First, we have the fact that the sound is seriously diminished. Why is it? Is there any interference of any kind, wavy or substantial? Not a bit of it. We will go back to our pin. *Sound is best conducted by the air in straight lines, in the direction of the vibrations of the sounding body.* This is the key to the entire puzzle. Proof. Let the right hand face C of the fork be held over the open end of a resonant tube or box. The resonance will be loud and full. Twist the fork till the so-called silence position is reached. The fork is now over the *centre* of the tube. While in this twisted or angular position simply move the fork to a position over one side of the tube. That is, if you have twisted the fork to the right as a screw is turned, move the fork over the right side of the column of air in the tube and *at once you have all the original resonance and power.* A small diagram will be a great assistance.



The fork held at A, gives the silence of the wave-theorists. Simply moving it to B, restores the *full resonance*. Notice that the angle is not changed in the least, so that no condition which enters into the asserted phenomena of silence, is altered. Tyndall says that the reason we get silence at A is because in that position we have the air in the tube symmetrically distributed either side of the fork; but aside from the inherent absurdity of this, he kills it himself by stating that the fork may be held at B or C in such a way as to produce silence, but he totally forgets to explain anything about "symmetrical" in this case. *The silence is absolutely a myth.*

The plain, common-sense explanation is given in the diagram by the dotted lines. In the position A, the stream of sound from the left or lower side of the face designated by the number 3, just misses the box, as shown by the dotted line. That is to say, the principal stream, which as we have shown is conducted *strongest in the direction of the vibrations.* The stream of sound from the inner faces of 3 and 4 are of course pretty much arrested by reflection and counter reflection, so that from these faces very little comes into effective play, except as the secondary sound particles split off and spread around. (See *Problem of Human Life*, pages 155, 156, etc.) The stream of sound from the right or upper face of 4 evidently strikes off into the air, and can only effect the air in the box by the "spreading around" process just referred to. Note also that this effect from secondary spreading is only likely to act from the side of the fork *nearest the box*, for of course what spreads upwards towards the letters A, B, C, can not be considered for a moment. This may seem to be tedious, but it stands the test of the strictest investigation most beautifully in every part. For example, let the fork be held flat over the box, one face up, and the other down: a loud resonance is obtained, possibly louder than in either of the three positions in our diagram. Why is this? Because from the lower side all the sound is carried straight into the box, and the spreading process has an equal chance right and left. Try it and see how perfectly it works.

When the fork is held at B, we have *nearly* the fullest resonance that can be obtained. Reason. The stream of sound from 5, as shown by dotted line, has a good clean chance to strike the column of air, the slight loss of sound as compared with the flat position just mentioned, if indeed any can be perceived, being evidently due to the small amount that "spreads" up toward the letter B.

Reasoning by analogy, *before trying the experiment*, I said that in the position C, there ought to be an increase of sound over A. Because; the same direct stream from 1 (see dotted line) would be lost, but the "spreading" from 1 and 2 downward would have a better chance to get into the box than in the position A, there being more room in which to make the turn. I then tried the fork in the position C and found it to give much more resonance than at A, although not nearly so much as B.

The ear presents to the fork a small confined column of air, which is made resonant to some degree; but we do not need that, and manifestly it *could not resound to more than one note.* When the fork is held square to the ear the face C, in first diagram, being flatly presented, the sound is loudest. *Simply because the most*

sound enters the ear. If a garden-hose, with a rose or scattering nozzle, be directed plumb into the end of an open pipe, more water will enter the pipe than when the stream is directed obliquely across the mouth. The analogy is nearly perfect. When the fork is twisted near the ear, the stream of sound simply misses the ear, and of course there is a marked diminution. While holding the fork in this twisted position before the ear, it will have the position A, relatively. Let it be now moved to B, or to one side, so that the direct stream of substantial sound can enter, and *you will hear as much sound as before*. At this point we will drive another nail gratis.

Sound your fork, cover one prong with a tube, notice the increase of sound, then hold your ear in the proper angular position to the single prong outside the tube, and at once you will notice the same kind of silence claimed by the wave-theorists. That is, you obtain or notice a very great loss of sound. Will Prof. Tyndall claim any interference here with the single prong?

We wish to be perfectly fair, and therefore will close this article with a full quotation from Tyndall, in order to show that he noticed most of these phenomena, while miserably failing to explain them. On page 273 we read :

"Bringing the fork over the jar, I cause it to rotate slowly. In four positions you have this loud resonance [notice, he gives no difference between any of the four]; in four others absolute silence [?], alternate risings and fallings of the sound accompanying the fork's rotation. While the fork is over the jar with its corner downwards, and the sound entirely extinguished [?], I pass a pasteboard tube over one of its prongs; a loud resonance announces the withdrawal of the vibrations of that prong. [We have shown this to be caused by the added resonance of the tube.] To obtain this effect the fork must be held over the centre of the jar, so that the air shall be symmetrically distributed on both sides of it. [Just consider our last diagram to see the shallowness of this reason. Look at the position A and see how utterly ridiculous the idea that the air is "symmetrically distributed" with regard to the stream of sound from the fork. If the fork were held flat over the tube things would be much more symmetrical.] Moving the fork from the centre toward one of the sides, without altering its inclination in the least, you obtain a forcible sound. Interference is possible however near the side of the jar. Holding the fork, not with its corner downwards, but with both its prongs in the same horizontal plane, a position is soon found near the side of the jar where the sound is extinguished."

Now in the name of reason why did not the Professor explain why, in this case, utter absence of any "symmetrical distribution" of the air on both sides of the fork, causes no hitch in his wonderful logic? A moment ago we were told that interference occurred in the middle, because the air was "symmetrically distributed on both sides of the fork;" and we are also told that interference is not possible at one side, because of this want of symmetry; but now the learned Professor coolly ignores the patent fact, that nearly all the air is on one side of the fork, and symmetry has completely vanished, but announces without hesitation that there is so much interference that the "sound is extinguished." As to fact, we flatly deny that a fork can be held over a tube or box with the side down, in any possible position, without an audible sound, and a considerable one at that. Let all doubters try it for themselves. Isn't it about time that Prof. Tyndall inspected the lines of his reasoning to see if their "symmetry" needs any rearranging?

Many of the above paragraphs would appear much more forcible, if I had enlarged considerably upon the points made; but space is so limited that I was compelled to condense.

I therefore ask every student to read slowly and carefully, and to weigh well the full effect of each argument. In the next article I promise the readers of *The Microcosm* a genuine discovery, made by Dr. Hall and myself, while experimenting in his office with a large fork.

CHESTER, PA., MIL. ACAD.

PROF. COMSTOCK ON THE LOCUST.

SOME time ago we received a letter from the above-named Professor of physics in Knox College at Galesburg, Ill., ordering his MICROCOSM discontinued which has been done, though we still send it free to his College Library for the benefit of himself and his misguided students. The Professor took occasion to declare that we were entirely deceived in regard to our locust-argument,—that the problem was easily explained as to how the four cubic miles of air were shaken, condensed and rarefied by the sound of the locust without the exertion of only the ordinary strength of that insect,—and then he went on to enlighten us by saying it was owing to the elastic nature of the air-particles and the philosophical manner in which they transmit the "moment" of one particle to another, and that it is all simply and easily illustrated by studying the action of a row of elastic balls in contact with each other, and the manner in which an impulse or motion given to one end of the row is communicated by the elasticity of the balls to the far end, driving the last ball away, etc., all of which we had read before in the writings of Tyndall and others. He then went on to elucidate it and to apply the principle involved to the four cubic miles of air which is really shaken by its elasticity as he holds, after the locust exerts its diminutive force in disturbing the small fraction of air immediately in contact with its body; but unfortunately for MICROCOSMIC capacity and sagacity, his method of proving it was all worse than Chinese to us. He mixed up the real gist of the explanation, right where it should be plainest, with so many symbols, technicalities and unusual scientific (!) phrases and ways of stating simple propositions, that we became disgusted at such burlesque on a so-called "scientific explanation" of a proposition which, if true at all, can easily be so explained as to be brought within the comprehension of a child, and of course by the simplest language imaginable. He finally called every professor who has up to this time abandoned the wave-theory of sound, a man of no scientific repute,—a "humbug" and an "egotist," and ended by forbidding the publication of his letter in THE MICROCOSM.

Possibly, however, two or three sentences of this "explanation" quoted verbatim, as an illustration of the lucidity of Knox College on physical science, would not be a serious violation of the foregoing prohibition. Here they are:—

"Going out from the locust in any direction in a straight line, the resulting moment of the air-particles on that line is the algebraic sum of the moments of individual particles. Mark all those which are advancing X, and those which are receding —, and you will find that the algebraic sum is just the moment of the particles embraced in one wave-length. Hence we conclude that the final moment of the air em-

braced in the sphere surrounding the locust is the moment of one spherical shell of air having a thickness depending on the wave-length of the note sounded by the insect. The moment of one of these shells of constant thickness is the same as that of any other. Hence it is easy to see that the resultant moment of the air *consequent upon the vibratory motion produced by the insect* involves no such vast numbers as you claim," etc.

Upon reading this pretentious show of scientific learning with, as we felt, its ulterior purpose of darkening council in order to avoid any real explanation of the problem involved, we hastily wrote the Professor the following letter inviting him to write a genuine and understandable explanation of the locust problem for THE MICROCOSM. Here is our letter:—

Dear Prof. Comstock:

I have your letter and have carefully read it. I confess I do not understand you. Why is it, if you are so much superior in science and philosophy to those professors who have indorsed the new departure on sound, and who have abandoned the wave-theory, that you can't, as they do, express yourself so that a common and unmathematical person like myself, can understand you? Why can you not say in plain English what you really mean about the locust shaking four cubic miles of air? Why don't you say that the locust, by the physical strength of its vibratory organism actually shakes 20,000,000 tons of air (the weight of four cubic miles), that is, overcomes its inertia, starts it into motion from a state of rest, 440 times in a second? Dare you state such a monstrous proposition in plain English? No sir, I believe you dare not do it! Yet you teach it in teaching the wave-theory, and now when asked to explain how an insect can do such an almost infinitely prodigious work you mix it up with a lot of scientific or at least technical verbiage that is non-committal, and from which you may easily escape when closely pursued, by using other technicalities less easily understood, etc. Now, Professor, just drop this style of argument with me, and say plainly that an insect can shake 20,000,000 tons of air or any thing else elastic or non-elastic, with a mechanical force sufficient to bend in and out 2,000,000,000 tons of tympanic membranes 440 times a second. Till you are ready to say this squarely, or else to say frankly that you don't believe it, or else explain what the locust really does do in plain words so that common-sense folks can comprehend you, I want no more scientific discussion with you. You surely can understand me and my arguments. Why can't you write so that I can understand you? The discussion of so simple a matter manifestly needs no special technicalities at all. Tell me then plainly just what the locust does do, and if it does not shake and overcome the inertia of the 20,000,000 tons of air, then how this mass of air is thrown into "condensations and rarefactions" by the sound of the insect which fills it. You certainly have some idea about it; so let us have it for THE MICROCOSM, if you feel safe in so doing.

Yours very truly,
A. WILFORD HALL.

In about a week thereafter we received an answer to this letter, the principal aim of which was to make his former explanation of the locust problem plainer, and we felt a sense of re-

lief on sitting down to read the communication, in view of the fact that we were going to have a genuine treat for our readers. But behold! after a most labored effort, at the closing paragraph (evidently having become ashamed of his inglorious failure in trying to make anything intelligible or consistent out of it) he peremptorily refused to allow us to publish it, though he manifestly intended it for THE MICROCOSM at the start, in accordance with our request. As the plot thickened with him, however, his argument evidently became seasick and in a frenzy of discouragement and disappointment he squelched the whole abortion by refusing its publication! We can only say that it was even worse as a whole, owing to its self-contradictory character, than its predecessor, though not so impossible to make out as to its teaching and general intent. Hence, we do not propose to let Prof. Comstock off scot-free by assisting him to cover up the deformity of his scientific idiosyncracies after bothering so long over his mathematical and mechanical disquisitions. We propose to let our readers have the benefit of a glimpse at such a rare and fair specimen of so-called modern science, especially after we had requested it for THE MICROCOSM. We shall therefore quote the heart of his article verbatim, and then proceed to cut the heart out of his argument:—

"For the sake of illustration take the following problem: 'There are ten perfectly elastic bodies whose magnitudes increase geometrically by the constant ratio 3: they are arranged in a row, and the first, which weighs 1 pound, impinges on the second with a velocity 5 feet a second and so on: required the motion of the last body, etc.

V. of 1st : V. of last :: 1 : (2-1 plus 3)⁹ or 5 : V. of last :: 1 : 1-512, hence the velocity of the last = 5-512: but the mass of the 10th (last) is 19683 and so the momentum of the 10th is 19683 times 5-512 = 192 111-512.

The nine smaller bodies all rebound with different velocities; if we compute those velocities, and multiply each velocity by the weight of the corresponding body the sum of the resulting products will represent the moment of the nine smaller bodies. This sum is 187 111-512. Now we have the motion of the 10 bodies all caused by the motion or force of the 1st body. Shall we *sum* these forces or moments, and say that the small body caused a force of 379 222-512? That would be your plan if you proceed consistently, for you say that the locust moves the *whole body of air*, paying no attention to the fact that *part of the air particles are moving forward and part backward*. No sir, you cannot take the arithmetical sum of those moments, but, calling the moment of the 10th body X, the motion of the remaining 9, which rebound, must be —; hence the resulting moment, or force, is 192 111-512 — 187 111-512 = 5, which is *exactly the force exerted by the 1st body*. Now do you see the point? You must estimate the force of the particles which are moving outward, or from the centre where the locust is placed, and from that sum subtract the force of the particles which are *moving toward the centre*. The difference (including all 'drum skins,' or whatever apparatus is connected with hearing) will *always be precisely the force exerted by the locust when the sound was produced*. This wonderful result is brought about by elasticity."

Here we have the important explanation at last. The disturbance of the *four cubic miles of air*—the throwing of it into “condensations and rarefactions” with force sufficient to bend in and out a tympanic membrane at every point of the enormous mass where the sound is heard which is every point—“*is brought about by elasticity*”! Yet the Professor really, as we are obliged to understand him, makes the locust do one-half of this entire work,—that is, give the air-particles the forward impetus, while “elasticity” causes their rebound or backward motion toward the centre where the insect is located! He really thinks that the return vibration, after the air-particles have been compressed by the locust, is accomplished by elasticity with which the insect has nothing to do! Was there ever such ridiculous philosophy before taught by a professor of physics? Really after such a display we are about ready for the total collapse of natural philosophy, especially if this is to be considered a fair specimen of it. Now we inquire of Prof. Comstock if we pull a stretched chord to one side and let it go, what it is that carries it 2,000 times back and forth across the centre of its swing before it comes to rest? We ask him this simple question, though we know positively from the foregoing that he could not answer it correctly if his position in Knox College depended on it. Of course he would answer that it was the “elasticity” of the string that caused these 2,000 continuous to-and-fro motions after the fingers had deflected the chord and let it go. He manifestly can answer nothing else. But it is an egregious error. *Elasticity* does nothing of the kind. It never caused the motion of anything and never can. It is a *property* of matter that *permits* motion of a certain character, or certain peculiar phenomena to take place by the application of adequate mechanical force. But the *elasticity* of a body, be it air, string or what not, can no more make that body vibrate, change its place, or rebound than can the *hardness* of a diamond make that stone cut glass. This property of hardness, however, may *permit* the diamond to cut glass by the application of mechanical force. So the property of *elasticity* in the string may *permit* it to keep up this vibratory motion, but it does not *cause* a single vibration. What then is it that causes these motions of the chord? Simply and plainly, *it is the mechanical force stored up in the chord in the act of first deflecting it with the fingers, and which force does not exhaust itself till the string comes entirely to rest.* Hence its motions *toward* or *from* the original point of deflection are equally the “result” of this same stored-up mechanical force, and not of the elastic property of the stretched chord which only permits this mode of motion to occur. “Now do you see the point?” We hope so, but we greatly fear at the same time that a professor who can say of the actual motion and rapid displacement of four cubic miles of air caused by the insect’s sound,—“This wonderful result is brought about by *elasticity*,”—is too far gone ever to be enlightened. Until he can grasp this elementary idea that any property of a body is only the permissible circumstance which allows a certain result or character of motion to take place by means of the application of mechanical force as the cause, he might as well retire permanently from his chair of natural philosophy, for all the good his instruction will

ever do the world. Think of a man teaching that if we press a piece of soft rubber with our finger the indentation is our work, but the return of the indented part to its original form on removing our finger, is the work of the rubber itself as the result of its elasticity, and that the original force of the pressure of our finger has nothing to do with it! That is exactly what he teaches about the locust’s action on the air,—one-half of the motion being its work, and the other half the work of the air itself through its elasticity; though at the end he contradicts it by making the entire motion of the mass of air the “result” of its elasticity save the first trifling motion of the insect’s legs. Whenever his eyes shall be opened to the true principles of physical science he will see that on compressing a spring the force of his finger is just as much the cause of the recoil on releasing it as of the original compression, and that the elasticity of the spring only permits this recoil through the force stored up by the original compression. If Prof. Comstock shall ever learn the A B C’s of physical philosophy he will see that the *rebound* of an india-rubber ball which he has thrown against a building is just as much the force of his hand as was the ball’s forward movement, and that no part of this motion is due to the ball’s elasticity as its cause. But for the elasticity, however, the entire force would expend itself on the building struck and the ball would stop there. But that elastic property in the ball permits a portion of the original force of projection to be stored up in the side of the ball and thus allows this force to act in the opposite direction by which to cause the rebound. Is not this plain even to a little child? Why can’t professors see it?

We earnestly commend to Prof. Comstock’s attention our reply on this very question to Prof. Carhart in the August MICROCOSM, present volume, which he had not seen when writing his letter from which we have quoted. He will there learn, possibly to his amazement, certainly to his personal advancement in science, that if the four cubic miles of air permeated by the insect’s sound is thrown into “condensations and rarefactions” as the wave-theory confessedly teaches and as he admits, then the locust by its physical strength alone actually overcomes the inertia of a mass of ponderous matter weighing 20,000,000 tons *avoirdupois* (that being the scale weight of such a mass of air), and just as difficult to displace as would be 20,000,000 tons of lead equally suspended. He will there learn by many proofs that the *elasticity* of the 20,000,000 tons of air no more helps the insect to overcome its vast inertia than would the malleability, ductility, or fusibility of the 20,000,000 tons of lead help to displace it. He will there learn that this inertia has not only to be overcome *once* by the strength of the insect alone, but that this enormous mass of air, if there be a grain of truth in the wave-theory, is made to change from a state of rest to a state of motion 440 times in a second. This too is what we call *dead change of position*, or a bodily movement of a weight without the aid of pendulous swing or vibrational number, no such thing being possible in such a mass of air or weight of lead. And finally, he will there learn and be forced to admit that since this mass of air is shaken by the insect with a mechanical force sufficient to bend “in and

out" a tympanic membrane weighing half a lection," "survival of the fittest," &c.—"This grain at every point in the mass large enough to contain one (say, one cubic quarter inch), that being the only way sound is heard, it follows that the insect by its stridulation exerts upon this entire mass of air a mechanical force equal to the displacement of 2,000,000,000 tons of solid tendinous matter, as a typo in figures can easily determine. Professors Comstock, Stahr, Carhart, French and others, who adhere still to the wave-theory may affect to sneer at these formidable figures and thus seek to laugh them down; but they will not down at any supercilious bidding. They have come to stay, and turning with a smile they invite the professors of the colleges to come into the columns of *THE MICROCOSM* and put them down if they can. But they get no response. Still, gradually but surely however, one by one, the ram-parts are falling, leaving it only a question of time when the gates of the citadel will be thrown wide open and *Substantialisim* shall be bid to walk in and take peaceable possession of the place. This *elasticity* dodge was manifestly one of the chief outworks of the defense, but its guns are now hopelessly spiked. Its defenders, green as a brood of unledged goslings, stupidly supposed that *elasticity* would save the lost cause and that it would do so by showing how an insect could start into rapid motion a mass of matter weighing 20,000,000 tons, and with a mechanical force sufficient to overcome the inertia of other and solid matter to the amount of 2,000,000,000 tons. But the unfortunate defenders overlooked the trifling all. That it is a *property* of matter whose office is merely to permit certain modes of motion to take place by the proper application of extraneous and adequate mechanical force. We are sorry for these mistaken defenders, and herewith give them another opportunity to throw down their arms and step into the ranks of *Substantialisim*.

HOW IT IS RECEIVED.

We have for half a century been observing the manner in which books and periodicals are received and welcomed or condemned by the press of the country. But we venture to assert that up to within the past three years no such favorable notices of any book has ever been read as those constantly showered upon the *Problem of Human Life*. We could fill an entire number of this magazine with notices of that book, any one of which would be pronounced extravagantly enthusiastic, but not one of which has been solicited by us or been written with our knowledge. We give below only one as a sample, clipped from the *Home Visitor*:

"THAT WONDERFUL BOOK OF THE AGE," *The Problem of Human Life*, by Willford Hall. If you have not seen it, by all means get it and read it. The book is a perfect "noon-day glare," a sun-track through the dark, doleful, godless skepticism of the day. A relentless cyclone, scattering to atoms the abominations of Infidelity called "evolution by natural selection," a tympanic membrane weighing half a lection," "survival of the fittest," &c.—"This easy to cry 'chaff,' 'chaff,' 'absurd'; but don't be a coward. Buy the book, read it, and be wise,—and then if you wish something fresh, crisp, delightful, instructive, by all means send \$1 to Hall & Co., 23 Park Row, N. Y., and subscribe for the *Micrococosm*, of whom also the *Problem of Human Life*" may be had. We are not advertising for Hall & Co., nor paid for this, but we are willing to do this much and more to advance the truth."

FIRST AND SECOND VOLS. BOUND.

We have sent off the first volume of *MICROCOSM* bound in cloth to all who have remitted the \$1; and have also sent the first and second volumes, bound in one superb book of 744 pages, to all subscribers who have sent the price, \$2.50. We remind our subscribers that we have the names of about 1,000 persons recorded who agreed to take vol. 1, as soon as ready, but who have not yet sent the \$1. There is not one penny made on these books, but we have them now ready, beautifully bound, at a large outlay, with editor's steel-plate likeness as frontispiece, and we trust each reader of *THE MICROCOSM* will feel it his interest to arm himself by placing a copy of both bound volumes in his library for future reference. The time may come when these volumes can not be obtained for love or money; so now is the time to send for them. Those wishing to canvass for the two volumes bound together will receive circulars. HALL & CO., 23 Park Row.

REVIEW. T. WILLISTON, M. A.
Next month we will commence a series of able philosophical papers on a couple of live theological themes such as that of harmonizing the present existence of sin with the perfection of God's fore-knowledge and His other attributes, and with man's freedom of choice and volition. This subject has already received quite an impetus from the very carefully written and thoroughly logical papers of our excellent contributor Prof. Kephart; and though Mr. Williston may and doubtless will strike a line of thought that conflicts somewhat with the views of Prof. Kephart, his papers (always elegantly written) will be none the less interesting on account of such diversity of opinion.

only one as a sample, clipped from the *Home Visitor*:

"THAT WONDERFUL BOOK OF THE AGE," *The Problem of Human Life*, by Willford Hall. If you have not seen it, by all means get it and read it. The book is a perfect "noon-day glare," a sun-track through the dark, doleful, godless skepticism of the day. A relentless cyclone, scattering to atoms the abominations of Infidelity called "evolution by natural selection," a tympanic membrane weighing half a lection," "survival of the fittest," &c.—"This easy to cry 'chaff,' 'chaff,' 'absurd'; but don't be a coward. Buy the book, read it, and be wise,—and then if you wish something fresh, crisp, delightful, instructive, by all means send \$1 to Hall & Co., 23 Park Row, N. Y., and subscribe for the *Micrococosm*, of whom also the *Problem of Human Life*" may be had. We are not advertising for Hall & Co., nor paid for this, but we are willing to do this much and more to advance the truth."

WILFORD'S MICROCOSM.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourself responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But generally, we hope and aim to be consistent.

EDITOR.

ELECTRICITY AS A MOTOR-POWER.

DR. KAVANAUGH'S MOON-PROBLEM.

LAST month we printed Dr. Kavanaugh's reply to our former objections to his theory of electricity as the "Motor-power of the solar system" which he has adopted instead of gravitation. It will be remembered that the Doctor in a long series of articles on this subject, extending entirely through Vol. 2d of THE MICROCOSM, elaborated his theory to what we supposed and even he supposed to be its philosophical limits. But when he had it thus nearly developed we sprung the difficulty, that though he had theorized the earth around the sun by electric action, he had failed entirely to make provision for getting the moon around the earth or any other satellite around its primary. The reason for this deficiency was found in the fundamental principles of his theory, namely, that the sun must be *positive* in order to furnish supplies of positive electricity while the earth and other planets must be *negative* in order to receive this motor-power and thus effect their orbital and axial movements by the *attractions and repulsions* of the two opposite electricities.

The Doctor was aware, of course, throughout all this chain of argument, that the *negative* moon got around the *negative* earth in some way about every twenty-eight days. Why did not this fact trouble him during all the long discussion preceding our objection? Plainly, because up to the time we sprung the difficulty he really, in a most sensible way, had taken it for granted that the moon's orbital motion was caused by gravity! He knew necessarily, from his entire argument in regard to the manner in which the negative earth got around the positive sun, that no such electrical attraction and repulsion could apply between the moon and earth according to his theory both being, as he admitted, "negative bodies." Hence the moon-problem was wholly outside of his original "motor-power of the solar system," and was naturally left to the "gravitation-ists" to manage in their own way. But when we pointed out the absurdity of the idea of two distinct and unlike motor-powers for the different members of the same solar system, and the incongruity of supposing gravity to carry the moon around the earth while electricity carried the earth around the sun and with the two classes of phenomena so almost precisely similar, the Doctor saw the point and recognized fully the extent and bearing of the objection we had raised, as well as the necessity of meeting it, or else totally abandoning his theory and thus falling back upon universal

gravitation which, up to this time, he had tacitly admitted to be all-sufficient for the moon's motions. He promised to consider the matter and to respond to our criticisms in a future article. After due time his solution of the problem came, verbatim as it appeared last month. He there flatly recants his former concession that gravity can have anything to do with the circling of the moon in its orbit around the earth, and asks to be forgiven for such an unwise admission. We freely forgive him, though, instead of recognizing it as a scientific sin it was really in our opinion one of the noblest philosophical virtues of which he has ever been guilty. He thinks, however, that he has redeemed his scientific reputation and vindicated the consistency of his electric theory by his newly discovered and remarkable solution of the moon-problem, which he says he found by "reverting" in his "*extremity* to Nature's own great treasury of truth", and "which", he says, "has never failed me [him] in any *emergency*." We agree with him that it must have been an "emergency" and even a desperate "*extremity*" in which he found himself placed by our objections, and we do not envy him the wear and tear of brain-molecules that worked him through it and helped him to reach even such an excuse of a solution as he finally obtained.

Before stating and replying to his new departure, however, we must notice an error into which he and others have fallen in regard to the substantial nature of the imponderable forces,—gravity, light, heat, electricity, etc. He truly says that gravitationists hold that the space through which planets and satellites move must be a vacuum in order to avoid obstruction; but he then adds that according to our view gravitation, light, heat, etc., are *substantial* and fill all space, and therefore must interfere with or obstruct the movements of heavenly bodies. Let us say, however, once for all, that *incorporeal* substances, unlike material substances, offer no resistance to physical bodies passing through them except in the line of their sympathetic attraction or repulsion, as the case may be. For example: Interstellar space, filled with light as it is, does not offer the resistance of a single mote of dust to the onward march of a Jupiter, because light is an *incorporeal substance*. Hence the current fallacy that the whole of interstellar space is filled with a "material" substance called *ether* employed by Nature to constitute light-waves in accordance with the undulatory theory, and which possesses the property of "inertia," similar to that of a "jelly", etc. Why did not Dr. Kavanaugh refer to "ether," this prodigious and necessary impediment to the move-

ments of planets, and as a just slap at scientific gravitationists? The reason is, he knew it would not hit us (since we repudiate this "jelly" humbug) any more than his misapprehension of the nature of incorporeal substance hits us. The whole thing, therefore, to use an Irish bull, is a miss-hit.

He further errs by repeating the oft-exploded charge that gravitationists can give no explanation of the simultaneous tide that occurs on the opposite side of the earth from the moon, when every elementary work contains what is considered a satisfactory explanation, namely: that on the side of the earth nearest to the moon its attraction tends to pull the water away from the ocean's bottom, while on the far side of the earth the tendency is for the moon to pull the solid earth away from the mobile ocean, thus producing the same effect on both sides of the earth, namely, the rising of the water around islands, etc. Still the Doctor charges that no explanation of this double-tide is or can be given by gravitationists! But this is enough by way of preliminary skirmishing. Let us now consider the Doctor's own original discovery by which to get the moon around the earth by electricity and which came to him in his "*extremity*."

He first assumes and proves it by Prof. Tice and others, that there are currents of electricity passing around the earth below its surface from east to west, and then he supposes that these currents generate or induce other currents of electricity which pass outside of the earth in the opposite direction, or from west to east, corresponding to the direction of the moon. As this induction of opposite currents is known to occur in wires running near a main conductor, hence this mighty extension of the law by Dr. Kavanaugh. He supposes this induced current outside of the earth to extend, of course, as far as to the moon's orbit, and that it actually floats the moon along in its magnificent electric tide somewhat as a balloon is floated around the earth by a current of air, etc.

But the new theory is full of difficulties, any one of which we regard as fatal to it. The whole supposition, in the first place, of an induced current of electricity circling outside of the earth from west to east, is pure guesswork, inferred, as already hinted, from the induction currents known to be generated in wires running in close proximity to a main conductor. This uniform induction current passing around the earth from west to east has never been observed by any one, and no sign of its existence has ever been recorded. A rather slim capital of inference, surely, upon which to base a theory to supersede gravity, and we can, there-

lore, begin to imagine the "extremity" of the investigator who was forced to draw on such a source for a supply of important scientific facts.

Then, unfortunately for the Doctor, his best and most direct witness, Prof. Tice, from whose work he quotes, distinctly and carefully teaches that this supposed induced current must have a *conductor* by which to travel from west to east, as the *conduction current* travels through the earth itself and below the surface from east to west. That conductor he states, is the atmosphere surrounding the earth with which the Doctor positively agrees. But immediately upon this small capital of opinion he proceeds to spread his new departure to the orbit of the moon and assumes that between here and there numerous belts of this induced electricity circle about the earth from west to east *without any conducting medium whatever*, "in one of which [belts] the moon's pathway lies and is carried forward by its agency."

Now we deny the Doctor's right thus unceremoniously to ignore the testimony of his chief witness and his own clear admission that the induced current around and outside of the earth requires a *conductor*, and that this conductor from west to east is our atmosphere, and then to plunge into vacant space hundreds of thousands of miles beyond any conducting medium and still take for granted the existence of this same induced current traveling with a force sufficient to float the moon "by its agency." The very admission, both by Prof. Tice and the Doctor, that a conducting medium is needed for this induced current, and that this medium is our atmosphere totally bars the whole hypothesis of carrying such electric river to the moon's orbit.

But this is only the beginning of troubles. Before the Doctor could make the first step in this new direction he had to bid good-by to his original motor-power for getting the *negative* earth around the *positive* sun, since that has not the most remote resemblance to the new *electric-wind* process of getting the *negative* moon around the *negative* earth. In fact the Doctor's new theory is not one quarter as much like his old one as that was like gravity since they both involved the idea of *attraction*, while the new departure involves nothing resembling either attraction or repulsion, but is simply the action of an electric stream or wind that drifts the moon along in its current the same as a raft is carried down a river. In the old system of getting the earth around the sun, the reader will recollect that the central and essential idea was that the two kinds of electricity—*positive* and *negative*—were employed to cause the *attraction* and *repulsion* requisite

to keep the earth moving in its elliptical orbit and also around its axis. But in the new discovery all this is dropped,—not a word about attraction and repulsion or their essential importance as a "motor-power," for the simple reason that attraction and repulsion are unnecessary and out of the question in the new departure, the moon simply being required to float along in this ever-flowing river of electric fluid. We suppose of course, that a "negative" river of electricity would be just as available for such floating purposes as a "positive" river, and *vice versa*.

Now since the new departure, whatever the impracticability of the whole scheme, has the merit of extreme simplicity as a hypothesis, we respectfully suggest that the Doctor, if he is really serious in presenting it, reconsider his old "motor-power" of electrical "attraction and repulsion" by "positive and negative electricity" for getting the earth around the sun, and adopt in its stead the new solution which so *swimmingly* takes the moon around the earth. Why not let the earth *swim* around the sun from west to east in a similar river of negative electricity only on a larger scale, induced by the positive currents circling below the sun's surface from east to west? Surely what is sauce for this lunny goose ought to be sauce for the solar gander! It is also decidedly more scientific than to have two entirely distinct electric theories, to let the old one slide and so let the earth *slide* around the sun in a similar electric stream to that which so effectually slides the moon around the earth. Then for consistency's sake, if for nothing else, we beg of the Doctor to lop off with one blow of his astronomical pruning-hook the whole "attraction" and "repulsion" business so cumbersome, complicated, and difficult to be understood, and which constituted the bulk of his twelve papers in the second volume of *THE MICROCOSM*, and reconstruct his two theories into one on a new basis by organizing a great induction river of electricity circling about the sun from west to east and extending to the orbit of Neptune, as this distance is no more for the sun and planets than 240,000 miles would be for the earth and its satellite.

But this suggests another real difficulty. How does it come to pass that a subterranean stream of electricity circling around the earth from east to west, and so very feeble as scarcely to be detected by the finest instruments, is capable of inducing an opposite current extending 240,000 miles away from the earth which travels with enough force, without any conducting medium whatever, to sweep the moon along in its current, and that, too, when we never knew a current to be in-

duced even in copper wire more than a few inches away from the strongest conduction current man can generate? To base the moon's movement around the earth by electricity upon such slender data of inference as this, is like unto the Doctor's former theory of basing the negative earth's travel around the positive sun upon data inferred from the electrical attraction and repulsion of a string of tiny pith-balls. The stupendous results inferred in both cases remind us of the organization of a ten-million dollars' joint-stock company on a cash capital of five cents.

But the Doctor's new departure grows worse the closer it is examined. We know by experiment in the case of all induction currents, that those wires which run nearest to the main conductor always receive the strongest induced currents, and that those farther away receive less and less current till finally in a short distance all induction ceases. We conclude therefore that it must be, comparatively, a very weak induction current arising from the earth's electricity that extends to the distance of the moon, and that this current must necessarily increase very rapidly in force as we approach toward the earth. Hence, if it has force sufficient to drive the moon before it when 240,000 miles away, it ought to sweep trees, buildings, and every thing on the earth's surface from west to east with the besom of destruction! But it does not stir a feather right at the point where all true science would make it strongest. Hence, by irresistible logic we must conclude that induced electricity has nothing whatever to do with carrying the moon in its orbit, and consequently that Dr. Kavanaugh is mistaken, or else is joking.

But still further; by what process of reasoning or philosophical formula does the Doctor make that mighty river of electricity, that carries the moon from west to east, travel only at a velocity of about half a mile in a second, when its normal rate of travel on the earth's surface is known to be from 30,000 to 200,000 miles in the same time, according to different estimates? It is a very accommodating variety of electricity to say the least, whether positive or negative, that jogs along at the tardy pace of the moon just to meet the desperate "extremity" of a theorist driven to his wit's end for a "motor-power" other than that so manifestly and bountifully supplied by Nature. It will not do to say here that this river of electricity that drifts the moon travels at its normal and observed velocity, but that the moon necessarily drags along ten thousand times slower than the current which carries it owing to its inertia. Plainly such impediment, which might interfere at the start of the moon's mo-

tion, would gradually yield more and more with accelerating velocity till the moon would soon acquire the actual velocity of the stream that floats it. It is simply impossible to account for the moon's constant and uniform speed, year after year, floating in a river whose current travels thousands of times swifter than does the body floated. Besides this supposed stream of electricity which floats satellites around their primaries is self-contradictory in its velocity around the same planet. Take, for example, the two satellites of Mars, revolving close to their primary, both of course carried by a vast river of electricity circling around that planet, according to this newest "motor-power" of Dr. Kavanaugh. Plainly, if electricity really carries these two little satellites around Mars, it would readily be supposed that they ought to travel at the same velocity precisely. But the facts are that one travels about 9000 feet in a second while the other travels less than half that fast! Thus while the principles of projection and gravital attraction explain satisfactorily the motions of all satellites, within slight variations from accuracy, the principles of electricity explain nothing whatever concerning such movements, but on the contrary all we know of electric action here, such as induction, attraction, repulsion, velocity, etc., tends to show the impossibility of accounting for the motions of heavenly bodies by any such want of practical "motor-power."

We could thus fill many pages with valid objections to the new moon-motor of our esteemed contributor; but here is one more that will have to suffice, as we can give no more space to this subject. The currents of electricity known to pass through the regions that circle the earth have no fixed direction, and carry nothing with them nor in them. No corporeal body is stirred by such normal flows or currents pouring against it. They will not stir a feather or thistle down floating in the air, much less carry off a moon before them. When concentrated into a lightning-bolt it is true that electricity disintegrates objects struck, in some way that no one yet understands; but this is not the motor-power claimed by Dr. Kavanaugh, by which moons are propelled in their orbits. No one, not even this versatile inventor of motor-powers would believe that the moon is carried forward in its orbit by being continually struck in the rear by lightning! He holds that the moon is floated onward in a vast river of electricity insensible to our observation. Yet such currents, sometimes visible, pass through our atmosphere in various directions such as those which cause auroral lights and the invisible magnetic storms which

so frequently derange telegraph wires. Now we know positively that such circling and shooting currents of electricity, so far from being capable of displacing a moon or any other heavy body, do not even stir the air through which they pass, or move a cloud that happens to be in the midst of the most brilliant streamers and most active "merry dancers." To what "extremity," therefore, must the originator of this moon-solution have been driven, when he was forced into this far-fetched floating process that can float no ponderable body whatever? We have ourself sometimes experienced a similar "extremity" in seeking for solutions of difficulties growing out of new theories, and we know how to sympathize with our excellent friend.

Still, though we are thus compelled to discard the Doctor's electrical motor-power both in its old and its new features, we do not marvel that he should have been led into his original supposition that electricity, a mysterious force that yields so many genuine and wonderful results, might possibly serve as the "motor-power of the solar system," had we not already and all around us in plain view, a motor-power in gravity and projection abundantly sufficient for every such purpose. Still it is not surprising that this should be temporarily over-looked, and that a force that produces the multifold and marvelous phenomena known to result from electricity should inspire, in the poetical fancy of such an inventive explorer of Nature's mysteries as Dr. Kavanaugh, the thought that this same force might also be the "motor-power of the solar system," and that in this way he should pervert it to play a part in the physical drama of the universe not assigned to it on the dynamic programme. A force that will smite a tree to shivers by a disintegrating spark from a storm-cloud, that can be harnessed and trained to drive machinery, that will carry intelligent messages from continent to continent under the ocean in the twinkling of an eye, that will light our streets and houses and illuminate the northern heavens with its auroral pyrotechnics, needs only the fanciful inspiration of such a genius to make it sweep the moon around the earth as well as the earth around the sun, even though a normal electric current, unconnected with machinery, was never known to move the weight of a single ounce.

In sober earnest, looking at scientific facts and phenomena with that dispassionate coolness which we try in our investigations to bring to bear upon all such researches, we are forced to regard this late effort to ignore gravity with its well-known and ever-recurring mighty mechanical effects by the compara-

tively limited effects of electrical attraction and repulsion, as about equal to the scientific fancy of Prof. Tyndall in discarding the self-evident effects of the tremendous gas-wave generated at a magazine explosion, and attributing the destruction of buildings, etc., to the harmless action of the accompanying *sound-pulse* which was never known to do more than to cause the sympathetic vibration of a string or a tuning-fork's prong. And we confidently believe that the time will soon come (if it has not come already) when both Dr. Kavanaugh and Prof. Tyndall will see their mistakes. Whenever they do see them, THE MICROCOSM is an excellent medium through which to make to the public the *amende honorable*.

PROF. STAHR IN THE REFORMED
QUARTERLY.—NO. 2.

A FINAL DEMONSTRATION THAT FINISHES
THE WAVE-THEORY OF SOUND.

LAST month we promised a definite and conclusive reply to Prof. Stahr's chief criticisms of our treatise on sound, and here we proceed to give it, to which we invite the reader's careful attention. His very first criticism, as we then intimated, was a fatal blow at the wave-theory. Let us quote it:—

"The fundamental error which vitiates Wilford's whole argument of sound, is a wrong conception of sound-waves. *Sound* is really a sensation, that is, the impression made through the ear and brain upon the mind!" Page 312.

In this single brief paragraph, involving the definition of sound as opposed to our "fundamental error," the professor has not only abandoned the wave-theory but has completely stultified himself, and, as the reader will soon see, there is no possible escape for him. We proceed to show first, that he contradicts the theory as universally taught; second, that he conflicts directly with Nature and reason; third, that he flatly contradicts himself. These three definite specifications ought alone, if established, to end the controversy so far as Prof. Stahr is concerned, since he himself leads off with charging this as our "fundamental error."

1. The theory, as universally taught, is that *sound* is constituted of air-waves, each wave consisting of a "condensation and rarefaction of the air," not of a mental "impression" or "sensation" caused by such wave. We could quote a hundred passages from the highest authorities on acoustics to prove that *sound* is that very *wave-motion* which travels through the air from the place of origin, or from the sounding instrument, to the ear and to the brain where it terminates in producing the "sensation" of hearing as its effect. This mental "impression" is not *sound* at all, but is the final effect of sound upon the brain and mind. If it is ever called *sound* it is by a well-known trope called *metonymy* of speech by which the effect is put for the cause. No man competent to teach a country school could soberly and literally thus pervert science in his blind opposi-

tion to Substantialism, and then, because we had not perpetrated the same worse than school-boy blunder, charge it upon us as our "fundamental error." If sound is fundamentally but "*the impression made through the ear and brain upon the mind*," then that which produces such "impression" by beating against the tympanic membrane and bending it "in and out," and which travels several miles from the sounding body through the air in the shape of "condensations and rarefactions," as the wave-theory teaches, is not sound at all. Hence the wave-theory, which teaches that sound consists of such air-waves, is false, and Prof. Stahr has thus abandoned it as a fallacy. There is no escape here for our assailant. He surely dare not claim that it is the mental "impression" that travels miles through the air before the tympanic membrane is hit by it so as to make the impression! He thus squarely surrenders and gives up the wave-theory of sound at his first blundering assault. Now to clinch this fatal nail, let us give a couple of proofs from authorities which our critic will hardly dare dispute. Tyndall says:

"Thus also we send *sound through the air and shake the drum of the distant ear*." "*Lectures on Sound*," p. 5.

That is, according to the distinguished scientist of Franklin and Marshall College, and the champion par excellence set for the defense of the wave-theory in the *Reformed Quarterly Review*; thus do we send the mental impression through the air and shake the drum of the distant ear, when the ear has first to be shaken, according to the wave-theory, before the mental impression can exist! Prof. Helmholtz takes the same view as Tyndall. He says:—

"Corresponding to this ring of wave [produced on water], *sound also proceeds in the air*," etc. *Sensations of Tone*, page 16.

What nonsense to say, as does our reviewer, that the mental "impression" "proceeds in the air" when this something which proceeds in the air, which Helmholtz calls "sound," has first to reach the ear and bend its membrane "in and out" before the mental impression can be made!

2. But Nature also contradicts our unfortunate critic. If *sound* is the sensation of *hearing* then *odor* must be the sensation of *smelling*, as a matter of course. Thus according to Prof. Stahr the "particles of the odorous body" which Prof. Tyndall admits to constitute "odor" have no existence outside of the brain because the "sensation" of *smell* or the mental "impression" is all there is of odor!

The sensation of *seeing* also must necessarily be all there is of *light*, according to the same embodiment of scientific wisdom. Yes, if he should happen to be alone in the world and should shut his eyes, he would thereby put out the light of the sun, because forsooth no one would experience the sensation or mental impression of sight that is normally caused as the effect of the sun's rays. Hence the rays of light themselves would cease to exist by the act of closing his eyes! We are free to say that our book does not "represent" any such slovenly "science" as this.

Possibly this "fundamental" doctrine of sound, light, etc., has been handed down to our critic by his peculiar theistic "survival of the fittest" from one of his remote ancestors who holds to the same scientific theory, namely, that light consists only of a mental "im-

pression." Hence he thrusts his head into the sand when closely pursued thinking thereby to produce darkness and thus evade the hunter. But he commits a "fundamental error"! We do not deny that our reviewer has evolved considerably in some respects since his line of descent divaricated from the feathered biped, but he hasn't improved a cent's worth either in logic or scientific perspicacity. We can inform both Prof. Stahr and the ostrich, however, that if every living thing should stick its head into the sand, it would not thereby change the light of the sun or lessen its quantity in the slightest degree; and that the mental impressions we receive through the five senses are quite distinct from the external and substantial agents, sound, light, heat, odor, &c.—which act on the senses to cause those impressions.

For example, if the Professor were to encase himself in *ice* so as to feel no heat from the sun's rays, they would not cease thereby to strike his covering, though it would be a "fundamental error" to teach that the effect of heat on the inanimate ice would be a tactile "sensation" or a mental "impression"! And even though our Professor, thus protected by an icy coat of mail, should feel no warmth whatever from the heat-rays of the sun, he ought to be able to judge that this absence of mental impression does in no wise destroy the sun's heat *if he would simply observe the mechanical melting of the ice around him!* But this kind of reasoning was manifestly too heavy for a critic who does so much of his reading, thinking and reviewing "unconsciously." Had he been only half conscious when he penned this first and "fundamental" charge of error he would not have so fatally put himself in our power, and so thoroughly abandoned the wave-theory at the very start. But we can assure him on general scientific principles that if not a single optic or tactile nerve, or even brain or mind were in existence to experience the sensations from light and heat, the sun would still continue to shed its unseen light-rays and its unfelt heat-rays upon this earth all the same, and would continue to demonstrate their mechanical and actinic effects on snowdrifts and vegetation. And if every olfactory nerve in the universe were this moment paralyzed or aborted, even a professor of physics may yet evolve far enough in natural philosophy to learn that the wild rose of the prairies would still continue to "*blush unseen*," and "*waste its fragrance on the desert air*," unsmelt. And finally if every ear were stopped so that no sensation or mental impression could result, it would still be a fact that the harp-chord would awake into sympathetic action and vibrate mechanically by the *sound* of its unisonant fellow. Is it possible that Prof. Stahr has yet to learn that this mechanical effect,—the sympathetic vibration of a string by the sound of its unison neighbor,—can neither be a "sensation" nor a mental "impression"? Yet it is universally admitted to be the result of *sound* and of nothing else.

3. But he contradicts himself in the very next sentence after uttering this suicidal and ridiculous definition of sound. He tells us that the vibrating instrument produces a "molecular tremor which is *propagated* from particle to particle *as far as the sound reaches*!" That is, as far as the mental "impression" reaches! But still worse. He talks much about the "*ve-*

locity of sound" in various conducting media, such as *air, water, iron*, etc. What nonsense! There is no such thing as "*velocity of sound*" according to his own learned definition of the word, since *sound* is the "sensation" or "impression" made upon the brain and mind! How can a mental "impression" travel through the air 1,120 feet in a second, or through iron 19,000 feet in a second before it reaches the brain in order to *impress* the mind? Yet this is the heralded critic who was to destroy the *Problem of Human Life* with his "two-edged sword" in the most prominent Quarterly in the country! Out of sheer sympathy for his friends we will not pursue our answer to this "fundamental" criticism further. Clearly if our "fundamental error" can thus be turned fatally against his attack our lesser errors do not need defending.

But this is not his most successful or glaring attempt at overturning the wave-theory of sound. We have, as already stated, only to use his own admissions against him to demolish the theory at each criticism he attempts. These are better by far than anything we can write since he is bound to accept and be crushed under the weight of his own scientific positions. For example he attempts to reply to our *fan*-argument elaborated in the "*Problem*," though he totally fails to grasp or even to refer to its main point. But this matters not. We do not expect a man who reads "unconsciously" to grasp anything against the theory he is teaching, or to admit it if he did, unless he should do so by oversight which, unfortunately for him, he does often enough for our purpose. We will soon establish the truth of this charge in such a manner as to settle Prof. Stahr and the wave-theory (so far as he is concerned) for all time. But we shall first be obliged to prepare the way for our final conclusion by a little preliminary explanation, as follows:

Our critic first correctly assumes as his basic position,—essential to the very life of the wave-theory,—that a sounding string or tuning-fork's prong must necessarily advance "*swiftly*," as Prof. Tyndall teaches, or with great velocity, in order to compress the air and send off a "*condensation*" at the known velocity of sound, or, in fact, at any velocity at all. All professors who have attempted to criticise our book concur unanimously in this, and agree that the fan's motion (7 feet in a second) is "*slow motion*" compared to that of the swiftly-advancing prong in order to meet the requirements of the wave-theory. In a few moments we pledge the reader to lay out this fatal admission so that the theory, necessarily based upon it, will never recover from the blow. Mark well this promise.

But notice first that Prof. Stahr entirely fails to see that the *condensing effect* of the fan's long motion can not be increased by dividing it up into numerous short motions, *each having no greater velocity of travel than the long one*. For example, a string moving through the air at its swiftest travel at a velocity of *seven feet in a second* and stopping at the end of a sixteenth of an inch, surely does not tend to condense the air or send off a compressed pulse any more than it would if it should travel seven feet at the same velocity and then stop. The common sense of every reader will force him to accept this. Suppose the string should make two such motions of a sixteenth of an

inch, stopping short at the end of each, but at the same rate of velocity—seven feet in a second—it is clear that the two short motions would no more tend to condense the air and send off an air-wave at the end of each than would one long motion at the same rate of velocity. How plain! Then if one long motion were to be divided up into 50 or 100 short motions but each at no greater rate of velocity, it ought to be clear even to a child that not one of the short motions would tend to condense the air or send off a pulse by stopping short after going a sixteenth of an inch any more than would the long motion do the same thing having the same rate of velocity. The whole error of Prof. Stahr is involved here, and consists in confounding in his mind the repeated stops and starts of a very slowly moving prong or string with what he calls "*rapid motion*." Yet the two things are entirely distinct. Really Prof. Stahr does not seem capable of grasping the fundamental fact in acoustics which annihilates the wave-theory of sound, namely, that a prong of a tuning-fork, by actual measurement and ocular demonstration, may stop and start a hundred times in a second and sound audibly *when its swiftest velocity of travel during any one of these short motions is less than at the rate of one inch in a second, as we have repeatedly proved!* Whenever the light of this simple truth shall flash upon his mind the mists of the wave-theory will vanish, unless they have grown like scales upon his eyes. We demonstrated in our reply to Prof. French, in THE MICROCOSM of last March, that a fork will sound audibly when its prongs are traveling at each swing not more than a distance of the *one-thousandth* of an inch, to and fro. Now suppose its vibrations to be 100 to the second, its whole distance traveled in a second in both directions is but the *fifth* of an inch. Then if we allow for it to travel four times faster at the centre of each swing than its average velocity (which is vastly too much) its swiftest travel is less than at the rate of one inch in a second. But by observing the motion of a long pendulum (which Prof. Stahr, in agreement with Helmholtz, admits to be similar to that of a tuning-fork's prong), we find that its velocity at the centre of each swing, if reduced to a small arc, is not more than twice that of its average travel including stoppages. Thus after making all reasonable allowances and then doubling them, we proved that the fork will sound audibly when its swiftest travel is at the exceeding low velocity of *less than one inch in a second!* So much for our arguments as heretofore published.

The Finishing Demonstration.

But now we come to the redemption of our promise to silence the advocates of the wave-theory so effectually, that they can never recover from the shock do what they may. Prof. Stahr, in particular, has been so lavish of his sneers at the "*mischievous*" book that he richly deserves annihilation (scientifically speaking), and here he is to receive his deserts. It was several months ago when we showed Prof. French and others that a tuning-fork would sound audibly when its prongs were not traveling at a velocity of one inch in a second; but this was before we had perfected our experiments upon this fatal phase of the argument against the wave-theory. In fact, we had scarcely begun to reach the extent of the

bearing of this objection against that theory. We are gratified that we now have something to announce to the scientific world which, as we confidently believe, will make Prof. Stahr quail, unless he is willing honestly to abandon the wave-theory as soon as he sees its foundation swept away;—then he will rejoice with all true lovers of science. Accordingly, we proceed to give the final overturn referred to.

We have demonstrated, in the *mathematical* sense of the term (and we will not keep the *modus operandi* a secret), that a tuning-fork will sound audibly, held in the fingers, when its prongs are not traveling to and fro a distance of the *one sixteen-millionth of an inch!* Doubling this distance, for the swing both ways, and we have the *one eight-millionth of an inch* as the entire travel of the prong through one complete vibration. Let us then use a fork having 256 vibrations in a second and we have the entire distance traveled by such prong but the *one thirty-thousandth of an inch in a second!* Counting the swiftest velocity of the prong's travel at its centre of swing as three times this aggregate distance passed over, which is more than the facts require, and we have, as the unanswerable result, *a fork sounding audibly when its prongs are traveling only at a velocity of the one ten-thousandth of an inch in a second at its swiftest motion, or at the rate of about one-third of an inch in an hour!* Is any professor of physics in America or elsewhere prepared to assert that such velocity of travel by a tuning-fork's prong will condense the air and send off air-waves at the velocity of sound, or 1120 feet in a second? Yet it is a positive fact that Prof. Tyndall describes this very motion of the prong—*one third of an inch in an hour*—as "*swiftly advancing*," while the greatest living physicist—Prof. Helmholtz—declares that such prong, in order to produce sound, must travel "*very much faster*" than the pendulum of a clock in full swing! Is it possible that the professors of our great colleges will not be able to see and feel the annihilating force of this demonstration against the received theory of acoustics?

But the scientific student naturally asks, and has a right to ask, how is it possible for you to "demonstrate" mathematically and mechanically such an astonishing result, and thus actually measure the travel of a prong when swinging to and fro a distance of only the *one sixteen-millionth of an inch?* We answer, easily enough. It only requires a little practical, original common sense, after first entirely ignoring the misleading text-books on the subject, and any beginner in natural philosophy, having a good tuning-fork, can make the same demonstration. Here it is, and let wave-theorists take particular notice.*

By the well-known experiment of attaching a delicate style to a tuning-fork's prong, and then slowly drawing the fork, while sounding, over a piece of smoked glass, we produce a path of sinuosities where the style touches the glass exactly corresponding to the prong's vibrations for any given period of time. When we have thus determined the number of vibrations in a second, we can easily measure the ratio of decrease in the width of swing or amplitude of the fork's sinuous path for the same, or any

longer period of time. By this simple experiment, repeatedly tried, we have found that a tuning-fork loses one half of its amplitude of vibration in something less than *four seconds*, thus reducing it, in round numbers, from the *sixteenth* to the *thirty-secondth* of an inch. In the next four seconds, it is reduced to a *sixty-fourth*. In the next to the *one-hundred and twenty-eighth of an inch*, and so on, very nearly, as long as the amplitude of the path can be measured under a powerful magnifying glass. This rapid change in the width of swing can even be seen with the naked eye by looking directly at the fork held to the light,—and by simply watching the decrease of amplitude during the first eight or twelve seconds after striking it against its pad. This, however, does not complete our demonstration, but it lays its foundation in immutable fact. Here is its culmination. Any good tuning-fork will sound audibly a full minute by the watch if held in the fingers at one end of a long tube with the ear at the other end. We have a fork now in our fingers that sounds distinctly 80 seconds after having been struck and thrown into vibrations of the sixteenth of an inch amplitude. Hence we need no more than throw out this hint, to enable even a beginner in science to complete the explanation for himself; but we will add, that by thus reducing the amplitude of swing one half for each four seconds, or *twenty times* (during the *eighty seconds* the fork is sounding), we have the last reduction of amplitude demonstrably measuring but the *one sixteen-millionth of an inch* with the fork still sounding audibly, thus totally breaking down the wave-theory on the necessary admission of its universal teaching, namely, that the prong, in order to produce sound, must vastly outstrip the speed of a clock-pendulum, and must "*carve the air into condensations and rarefactions*" by "*swiftly advancing*." (Tyndall, *Lectures on Sound*, page 62; Helmholtz, *Sensations of Tone*, page 28).

As such motion will not be claimed by any one as sufficient to send off air-waves; hence the theory which teaches that sound is constituted of "condensations and rarefactions of the air" is necessarily false, and the new theory—*Substantialism*—which teaches that sound, like electricity, consists of *incorporeal but substantial pulses*, radiating from the sounding body by a law of conduction of its own, according to the nature of the medium, analogous to that which conducts electric discharges, is beautifully and rationally established, taking the place of the old theory in the mind of every intelligent scientist who will reason logically.

And here we believe we are fairly entitled to claim, without boasting or without being chargeable with undue egotism, that this demonstration involves the most important and wonderful discovery ever made in acoustics;—the most *important*, because by it alone is broken down a theory of science that has stood unchallenged and even undoubted for centuries; and the most *wonderful*, because of the fact that the greatest scientific minds of the world, as the text-books show, during all these centuries, have honestly supposed that the prong or string in order to produce sound must advance "*swiftly*", as it evidently would have to do if the wave-theory were true. A discovery that overturns all this from its very foundation, and which demonstrates that the prong sounds audibly while really traveling but *one tenth* as

* Those desiring to verify these experiments can have a good A-tuning-fork sent by mail for \$1, by addressing, Hall & Co.

fast as the hour hand of a clock, is surely enough to cause candid scientists to hold their breath and open their eyes with astonishment.

Now, will *Science*, the *Popular Science Monthly*, the *American Journal of Science*, the *Review of Science* or any other scientific publication copy this demonstration and either try to overturn its logic or else frankly confess its unanswerable character, and thus abandon the wave-theory? We will send marked copies of this Magazine to fifty or more scientific journals in this country and Europe, so that they and scientists throughout the world shall be left without excuse.

Returning to Prof. Stahr, who, we fancy, has been all this while calling for the walls of Franklin and Marshall college to fall on him and hide him from the wrath to come, we will now proceed to finish him with as little torture as possible, as we do not believe in vivisection. Having thus fitly prepared the way, by a demonstration that must startle even Prof. Stahr, we are now ready for his unconditional surrender. Here it is:

"No motion in the air unless it is sufficiently rapid to produce condensation and consequent rarefaction can ever produce sound." Page 318.

That is, as the professor means, it can never "produce sound" according to the wave-theory. This is manifestly plain. But it does "produce sound", as we see by our demonstration, when the motion of the prong is the slowest of which we can conceive,—as much slower than the travel of a snail as the snail's gait is slower than the speed of a lightning express train! Hence, Prof. Stahr deliberately abandons the wave-theory and steps over into the ranks of *Substantialism*, virtually conceding that the sound of the fork thus slowly moving must consist of substantial though incorporeal pulses, since "no motion in the air, unless it is sufficiently rapid to produce condensation and consequent rarefaction can ever produce sound" according to the wave-theory! We welcome this new convert with open arms, though he has evidently stepped into the substantial fold "unconsciously," the same way as he confessed to having read our arguments against evolution.

But lest there might be an attempt to hang a quibble upon the term "rapid" in this last quotation, as meaning only the repeated stops and starts of the sounding prong and not its velocity, we must let the professor tell exactly what he does mean by such "rapid motion." Here it is:—

"The slow motion of a body in the air [by which he refers to our fan's motion, 7 feet in a second] only displaces its particles, producing a temporary disturbance, but no air-wave or sound-wave. Rapid motion, on the other hand, implies impact, a stroke upon the particles with such velocity that they have no time to move aside or slide over each other!"

Here we have at last the final and complete catastrophe of the wave-theory. The fan, he tells us, moving seven feet in a second, is "slow motion"—too slow to produce an "air-wave or sound-wave"! It must have greater "velocity"! It must have "rapid motion". Then he explains "rapid motion" to be "a stroke upon the particles with such velocity that they have no time to move aside"! Yet, be it known to the students of American colleges, and to those of Franklin and Marshall in particular,

that a fork will sound audibly, even held in the fingers, as just shown, and as any beginner in acoustics can demonstrate by experiment, *when its swiftest travel is at the rate of but one third of an inch in an hour*, or with 900,000 times less "velocity" than what Prof. Stahr calls "slow motion,"—too "slow" ever to "produce sound" by air-waves! Was there ever before, since the dawn of science, so disastrous an overthrow of a theory?

The received doctrine of acoustics thus being inherently false and contrary to the very principles of true science, it is necessarily incongruous and self-contradictory. Its different parts can never agree or be made to cohere, even when brought together by the most profoundly skillful and adroit critic. Had we space to spare we could thus take up each paragraph of this review, and point out some incongruity—either a contradiction of some part of the theory or else of the critic himself. But we have done enough and more than enough, and will have to cut our reply short by coming to the most important part of it in one essential respect. We refer to the professor's frank confession that he had entirely failed to touch our two most important arguments against the wave-theory, though he had time to criticise elaborately several unimportant matters, such as the ratio of sound-decrease as the square of the distance from the centre, and which, whether we were in error or not, have no essential bearing upon the main controversy. We now ask the candid reader, why did our reviewer waste much of the twenty-four pages of the *Quarterly* on unimportant criticisms only to ruin himself and destroy the theory, as the result has shown, while deliberately leaving untouched our two strongest arguments against the current view,—arguments which he knows to be unanswerable,—namely, the mechanical effects of sound on four cubic miles of air by the stridulation of a locust, and the law of wave-interference lying, as is well known, at the very foundation of the wave-theory? Here is his humiliating and disingenuous confession:

"It was our intention at this point to take up the objections urged against the undulatory theory on account of supposed *mechanical difficulties* involved in it, and then to turn to the subject of *interference*. . . . But our space is exhausted, and as these points are *merely incidental*, and we believe that any one who has fairly mastered the *fundamental idea of wave-motion* can easily work out his own solution, we forbear for the present." (page 329.)

This, if not "unconsciously" written, is another positive evidence of scientific dishonesty, much as we dislike to make such a charge against a "Rev. Prof." in a respectable college. But Prof. Stahr must have known when he wrote the sentences quoted, that we had placed these two arguments against the wave-theory as among our very strongest objections; yet he calls them "merely incidental"! He knew further that he could not successfully reply to either of them if his life were at stake upon the result; yet he refers to them as of so little importance that they had almost escaped his memory till too late to be noticed! He even intimates by his last sentence—"we forbear for the present"—that he will attend sometime in the future to this "merely incidental" matter! Yet he knew in his heart when he wrote it, that he never intended to touch those argu-

ments or refer to them again, unless forced to do it.

Next to these two arguments against the wave-theory we have always regarded the very slow motion of the vibrating string or prong while sounding, and the impossibility of such motion condensing the air, as our third strongest argument. Prof. Stahr, by not having been a reader of *THE MICROCOSM*, and unfortunately by not possessing any really sharp critical power, imagined that he might succeed in weakening the force of that argument. He tried it, as the reader has just seen, and to his own utter discomfiture and that of the theory he undertook to defend. So would it have been had he attempted to show how a locust by its physical strength can overcome the inertia of four cubic miles of air (weighing the same precisely as 20,000,000 tons of pigiron), move it from a state of rest 440 times a second, and with a mechanical energy sufficient to bend in and out 2,000,000,000 tons of tympanic membranes, as we have so repeatedly proved in this magazine. So also would he have fared had he attempted to defend the law of sound-interference, lying as it does at the very foundation of the wave-theory, namely, that two unison instruments, however powerful, will silence each other by producing quiescence of the air in the line of the said instruments if sounded half a wave-length apart, or in such relation to each other that the "condensations" from one instrument will fall into the "rarefactions" from the other. He knew that we denied in toto the truth of this law, or that the slightest difference would occur in the sound-intensity of the two instruments by such assumed interference, though it evidently ought to produce quiescence of the air and consequent silence if there is any truth in the wave-theory. But he had scientific perspicacity enough, with all his want of critical ability, to conveniently forget these two "merely incidental" arguments till too late to attack them, though he positively knew that either one of them involved the very life of the wave-theory!

Now we propose to test both the courage and the honesty of our critic, so that all men shall know how to estimate him in the future; and to this end we hereby challenge him to write six, eight, or ten pages more for the next number (January) of the *Reformed Quarterly Review* directed wholly against these two "merely incidental" arguments, and we now pledge ourself that if he shall refute them, we will publicly abandon our opposition to the wave-theory, and in the next number of *THE MICROCOSM* will peremptorily and in the most public manner renounce *Substantialism*. Nay; even better than this. If Prof. Stahr will answer and set aside our single "demonstration" on the slow motion of a tuning-fork's prongs while sounding, we will ask no more at his hands. Will he dare to undertake it? Surely, if there be any truth in the wave-theory these arguments ought to be blown away like chaff before a hurricane by a critic so learned and brave as our professor. We demand of him that he try it. And we further insist, in the interests of true science, that Dr. Apple, editor of the *Reformed Quarterly*, not only permit Prof. Stahr to occupy the space suggested, but that he urge him to do so. We believe this to be his duty as president of the college, inasmuch as he wishes truth to triumph in science as well as in religion.

Having thus laid the challenge at the door of Franklin and Marshall College and at the very threshold of the *Reformed Quarterly Review* for a brief and final settlement of this entire sound-controversy, we, in company with thousands of Christian ministers will await anxiously a response to our proposition. What say Prof. Stahr and the Rev. Dr. Apple?

P. S. While the *Reformed Quarterly* and the *Reformed Messenger* are using their columns to create prejudice among their subscribers against the grand cause of *Substantialism* which we advocate, these editors would be amazed and chagrined could they read the letters of congratulation and encouragement we are receiving from scores of Reformed ministers among their most intelligent readers, and should they note how little weight these disparaging diatribes have upon such minds. We will add only one of these letters recently received as a sample of the tone of all:

A. WILFORD HALL, Ph. D.: *Dear Sir*—An absence from home of one month prevented my sending in my subscription in time for Vol. III of *MICROCOSM*. I now do so at once and also the amount for Vol. I. bound. I can not do without your publication. It furnishes more solid food for the intelligent, inquiring mind than any other half-dozen monthlies and quarterlies combined. I handed the specimen copy you sent to our Methodist minister, and he told me he would send for Vol. III. The ball is still rolling, notwithstanding some editors and professors of natural science are so deeply blinded by prejudice that they cannot comprehend the truth. God help you in your noble work, and may your "Banner of Light" reach 100,000 subscribers this year.

Yours fraternally,

D. H. REITER, Pastor Ref'd. Church.
FULTON, MICH.

THE NEW YORK INDEPENDENT AGAIN.

(From The Independent.)

"The *Reformed Quarterly Review* is always able; the current number is also trenchant. Prof. J. S. Stair, with "A Two-edged Sword" pounces down on Wilfred's "Problem of Human Life Here and Hereafter." Professor Stair is at some loss how to name his man, which is not strange, considering that he sometimes signs by "Wilford," and sometimes by "E. Wilford Hall", and as a matter of fact, is never either the one or the other. In this and the last number of this quarterly Professor Stair goes through the self-sacrificing labor of digging this fox out of his burrows—an expenditure of time out of all proportion to the importance of the book, but to be justified by its unaccountable currency. Correspondents who have wondered why we made such short work with it, and declined the drudgery of sober and minute refutation, will take note that what they want is in the *Reformed Quarterly* for July and April of the present year."

For blundering recklessness of statement, general incapacity to get at the truth, and stupid bigotry, the N. Y. *Independent* is certainly entitled to the first premium. We have never before known an editor who had a rarer faculty for getting off numerous inaccuracies (not to

use a stronger term) in a single short paragraph, than this same fossil who presides over the editorial department of the above named paper. He has repeatedly declared that he has not read the *Problem of Human Life* and that he will not read it, and yet he takes every occasion that offers, by favorable or unfavorable notices in other journals, to strike his aimless blows to the disgust of his readers, at what he confessedly knows nothing about. His conscience seems to worry him for his bigoted refusal to inform himself by reading the book, and thus blinded by prejudice he tries to make his readers think that he is very wise to be able thus to condemn without reading what they approve after careful study.

Take the foregoing specimen notice which we clip from a recent issue of what was once a high-toned Christian journal. Look at it and read it carefully, and then note.

The editor begins his series of blunders by speaking of Prof. "Stair's" assault upon "Wilfred's" book when it is *Stahr* and *Wilford*. He then deliberately fabricates, as a part of Prof. "Stair's" laborious demolition of said book, that he was "at some loss how to name his man," when not one syllable or intimation occurs in reference to such "loss" in Prof. Stahr's review. He then says it "is not strange" that Prof. "Stair" should be at such loss to name his man "considering that he sometimes signs by Wilford, and sometimes by E. Wilford Hall," the "E" being another pure fabrication of his own, such initial never having been used. Then to add to the string of misstatements he goes on to narrate the achievements of the said "Stair" in demolishing "Wilfred's" and "E." Wilford Hall's book, by another falsification of the record. He repeats that "in this and in the last number of this Quarterly Prof. Stair goes through this self-sacrificing labor," etc; and at the close, he again refers his readers to the "*July and April*" numbers of this Quarterly for Prof. "Stair's" "self-sacrificing" work, when he must have known that not one syllable from Prof. Stahr's pen, nor one reference to Wilford's book occurs in the "April" number of that Quarterly! But this champion falsifier evidently saw another opening to strike one of his haphazard blows at the hated book, and as is his wont, without even reading the review sufficiently to learn its author's name, he commenced drawing on his splenetic imagination for facts in order to fill out a brief notice of the *Reformed Quarterly*. And such a notice! We presume the Rev. Dr. Apple would sincerely thank the antideluvian of the *Independent* if in the future he would abstain from any reference to his quarterly in a journal in which few who read it have the slightest confidence, particularly upon the subject of book and periodical reviews.

By the way, how does he know that the review which he so highly commends, states fairly one single argument of a book which he publicly refuses to read? And what a caricature on "Independent" journalism to speak of the "self-sacrificing labor" of that reviewer being "out of all proportion to the importance of the book" which he has so often declared in his paper he has not read! What does such a blind leader know of its "importance" or unimportance? He speaks of the "unaccountable currency" of the *Problem of Human Life*! It is not at all "unaccountable" to those who

have read it, as hundreds of his own subscribers can inform him; but to a self-benighted bigot who refuses to read it, and who, no doubt, has not the capacity to comprehend it if he did, of course the book's "currency" is "unaccountable." But in his malice he occasionally blunders into the truth, as witness where he speaks of Prof. "Stair's" "self-sacrificing" effort; for if ever a college professor literally sacrificed himself upon the altar of fool-hardiness it was this same Prof. Stahr as our two replies in this and the preceding numbers of THE MICROCOSM will show. He has proved by his puny effort that it would take half a dozen flights of such "stairs" to reach even the tiniest argument of the *Problem of Human Life* against the wave-theory of sound.

The digging for a "fox," of which he speaks, as a part of Prof. "Stair's" self-sacrificing labor, is perhaps not the happiest illustration. A better one occurs in the *Independent's* "esteemed cotemporary," the *Age of Progress*, in its recent reference to the same and similar attacks of scientists. For the edification of the man who glories in his own shame by boasting of condemning a book without having read it, we quote just one paragraph:

"Whenever a college professor falls into Wilford's hands, it seems to us as though a *Mississippi alligator* was swallowing a rabbit! He serves them all alike, and we have no doubt it would be the same, only more so, if Tyndall or Huxley should attempt any reply to the doctrine of *Substantialism*."

In a later issue of the *Independent* the Editor discusses the claimed discovery of a Moabite manuscript of Deuteronomy by a Jew named Shapira, which of course he pronounces a fraud, and adds, for the benefit of his readers, that "It is as bad as Wilford Hall"! The man seems really to have become a journalistic monomaniac on the subject of "Wilford Hall." That name has become a nightmare that haunts him in his dreams for the cowardly manner in which he has treated the *Problem of Human Life*. He has tried to relieve his conscience by picturing this terrible author as a sort of personification of everything fraudulent and mean. Hence, in his references to forgers, humbugs, and impostors generally, nothing flashes so vividly and spontaneously across his mind with which to compare them as the apparition of the man whose acknowledged triumphs in science have unsettled the equilibrium of the diminutive and envious soul that controls the *Independent*. Hence the stereotyped wail of that haunted lunatic—*He is as "bad as Wilford Hall"*! Cannot some one go to the *Independent* office and cast out this devil that is tearing the editor and that will not let him rest?

In conclusion, after so many disingenuous references to this book, some two dozen or more, during the last three or four years, without venturing once to enter into an argument against it, or allowing any one to say a word in favor of it in its columns, is it not about time that the readers of the *Independent* had a little something besides these cowardly paragraphic slaps which so clearly betoken the envy of a jealous and malicious mind? Let this obdurate and inimitable blunderer now invite some able college professor of his acquaintance to attempt in the *Independent* to dig out this "fox" and defend the wave-theory of sound at the same time, and we promise his readers in

these columns a free exhibition of the show hinted at in the *Age of Progress*. The mother of the said professor won't know him after the MICROCOSMIC "alligator" gets through with him. If the *Independent* editor does not believe it, let him try the experiment.

THE NEW TEXT-BOOK ON SOUND.

THE amount of labor we have been obliged to perform in the editorial conduct of this Magazine, including the critical scientific controversies constantly accumulating on our hands, has prevented our progressing as rapidly as we had expected with the new text-book on acoustics. We had hoped to have it well near completed by this time, but we do not now regret the delay in view of the important results of experiments now being prosecuted by Capt. Carter and ourself.

Already we have achieved results on this question that must simply astound the scientific world. These results all tend in the one direction—the total extinction of the wave-theory of sound and the ultimate revolution of that branch of physics in our colleges and universities. This, to those acquainted with the facts, is a foregone conclusion. Hence, any delay in issuing the new text-book will be the permanent gain of students and teachers in having the new departure so thoroughly elaborated and demonstrated that the progress of teaching need not be impeded by continual controversy as to the truth of the new or the inherent fallacy of the old doctrine.

As a single illustration of the advance already made, students and teachers are referred to the "demonstration" on the exceeding slow motion of a tuning-fork's prong while sounding audibly, as so exhaustively elaborated elsewhere in our reply to Prof. Stahr. This single demonstration only goes to show what a surprising deception the scientific world has been laboring under for centuries, and what a mighty revolution is now pending in the immediate future in the class-rooms of our colleges.

As this volume of THE MICROCOSM is read by students and teachers in more than a thousand colleges and other institutions of learning in this country, we solicit the frank opinions of all concerned upon the revolutionary new departure herein advocated. Also we would be glad to have the names of all who regard favorably the proposed change in text-book from the old to the new theory, in view, mainly, of starting the new order of things as soon as possible after the work is ready, and as widely as may be practicable.

We are gratified to state that from hundreds of teachers, principals, and presidents of educational institutions we have already received words of strong encouragement in the direction named. We expect the number of such courageous friends of *Substantalism* rapidly to increase as this Magazine becomes more generally read in the colleges. As it is, the friends of the cause of true science have every reason to thank God and take courage.

P. S. As a single specimen of these letters of indorsement from colleges, here is one just received since the foregoing was in type, from C. H. Kiracofe, A. M., President of the Harts-ville (Ind.) University, and which will speak for itself:—

"A. WILFORD HALL, Ph. D.

***** I have been a quiet reader of what has come from your pen, but I wish now to express to you my thanks for the pleasure you have given me, for the advantage you have been to me in quickening my own thoughts, and for the service you have done in defending true science and religion. I have waited thus long to express my appreciation of your work, not because I was hostile to it, but because I wished to give sufficient time for the overthrow of your arguments before I put myself and the institution I represent on record in favor of the new departure. We no longer teach the wave-theory of sound as science, but as a theory worthy of consideration only as an example of what may be palmed off on the world as true science.

I am Yours Very Truly,
C. H. KIRACOFE."

THE "STRONGEST ARGUMENTS."

PROF. "W—," of Cincinnati, Ohio, requests us to print in THE MICROCOSM in a concise manner two or three of our strongest objections against the wave-theory of sound, and upon which we are willing that *Substantalism* shall stand or fall, and intimates that a reply may be attempted by an eminent professor of physics in a leading university in Ohio. He says that several professors have been conferring together upon the matter, and have decided that the controversy ought not to drag along in this *ex-parte* manner. That the wave-theory, as now universally taught, is either true or false. If true, then two or three of the strongest proofs in its favor ought to be sufficient to maintain it against all possible assaults, just as two or three well-known facts abundantly demonstrate the Copernican system of astronomy against every possible claim of the Ptolemaic theory. But if false, then he insists that two or three of the strongest objections against it ought to break it down; and that if such strongest arguments should fail, there could certainly be no reliance placed on the weaker ones, etc. To all of which we cheerfully yield our hearty assent, and by which we are willing to abide. Accordingly Prof. W— and all others concerned will find this very concise statement of three of our strongest arguments against the wave-theory in our reply to Prof. Stahr's criticisms printed elsewhere in this number. In fact we there give one single demonstration against the theory, based on the exceeding slow motion of the tuning-fork's prongs while sounding, which, as we claim, alone breaks down the theory. If any professor or combination of professors will answer that one demonstration and set it aside, as we have proposed to Prof. Stahr, we will at once hoist the white flag in these columns and surrender the fort of *Substantalism*. Surely this is more than fair, because it is more than asked. Now let Prof. W— bring forward his eminent university professor of physics, and let him show that the wave-theory can by any possibility be true in the face of that demonstration, and we here, in advance, proclaim his triumph complete. Otherwise, that is, if he shall fail to answer that objection, then the wave-theory must go. Let students of science in our colleges make a note of this very fair proposition and call the attention of their teachers to the

"demonstration" referred to, and then politely but earnestly insist upon their meeting it or else demand in the name of science that they acknowledge the current theory of acoustics broken down and at once cease to teach it. By this single argument against the wave-theory, and, as a necessary consequence, in favor of Substantialism, we bind ourself to stand or fall. Professors who seem to be so ready and anxious to attack and weaken the force of that "mischievous book" have here a splendid chance, if there is any force in their assaults.

As for the *three* strongest arguments in favor of the wave-theory, we deny that there is even one argument in its favor that cannot be swept away in a single paragraph. If any professor of physics in a respectable college thinks otherwise, we invite him, to write out briefly and concisely one such argument for *THE MICROCOSM* and send it along, and we will ventilate it for the edification of our readers.

HOW DYNAMITE ACTS.

(From the *Washington Critic*.)

"An experiment with dynamite was recently made by one of the officers of the navy yard. A quantity of dynamite was confined on the top of a stone five feet square and five feet thick by a wooden box one foot square and three inches high, without top or bottom, the explosive being laid loosely inside the impromptu fence. A fuse was applied and the assembled officers scampered off in different directions, fully expecting that the wooden enclosure would be blown into fragments. The explosion took place, and upon examination it was found that the wooden box had not been injured, while the dynamite had exploded downward in the direction of the greatest resistance, shattering the stone throughout."

THE above is an important experiment and involves highly interesting scientific principles. We referred to this matter in the *Problem of Human Life* in our reference to the fall of meteorites and to the fact that they become incandescent alone by friction with our atmosphere, on account of their great velocity. Some of these bodies strike the air at such enormous velocity, especially when they happen to collide in opposition both to the diurnal and orbital velocity of the earth's atmosphere, that the meteorite is crushed as if it had struck upon solid rock, so unyielding is even our attenuated air to sudden displacement. This seems impossible, at first thought, with a body of such rarity as common air. But here is a gas still lighter than air, generated by the ignition of dynamite, that travels so swiftly in all directions that the air cannot get out of the way but becomes like steel as a barrier, and the rock beneath is crushed by the inconceivable velocity of the contact and blow of this gas. Were the action of the gas generated by dynamite, of less velocity, like that of common powder, the air would have time to compress and get out of the way and thus, as is the fact with gunpowder, it would do no harm to the surface of the most delicate marble slab upon which the explosive might be ignited. We have even burnt a small pistol-charge of rifle powder in the bare palm of our hand without injury, the evolution of the gas being so slow as to produce little reaction.

In the experiment referred to at the head of

these remarks, the reason why the board box which held the dynamite in place on the surface of the stone was not broken is very plain. The gas acting beneath the loose sides of the box and over its upper edges compressed the boards on all sides alike, and almost at the same instant, while the elastic nature of the wood itself prevented the shattering effect as was witnessed in the case of the stone. Nitro glycerine acts the same. So does gun-cotton, in many respects. This instantaneous generation of the gases, in the act of igniting such intense explosives, prevents their use in gunnery, as no ordinary gun will stand this sudden expansion of the gas without rupture. Hence all such powerful explosives are used principally for mining and blasting purposes, and of course can be used by combined malice and ingenuity for the wanton destruction of life and property, as so recently demonstrated, and as now so greatly feared in England. It seems only a matter of prudent and humane precaution, to which no law-abiding man would object, that the most stringent legislative safeguards should be thrown around the manufacture and sale of these dangerous chemical compounds. If government detectives may properly be employed to follow the faintest clues to foil the nefarious schemes of counterfeiters, and thus protect citizens in mere matters of money, surely the circumstances justify the most stringent measures for watching every man who may be reasonably suspected of having anything improper to do with those infernal necessities of advanced civilization; and no well-meaning or moral citizen would object to personal search if proposed by the proper authority.

A SPECIAL REQUEST.

WE particularly request professors of physics to read our "demonstration" against the wave-theory of sound commencing on page 90, this number of *THE MICROCOSM*, and then to verify the calculation by repeating our experiment with the tuning-fork, after which we desire as a special favor their candid opinions as to the bearing of that argument against the current doctrine of acoustics. If any possible way can be thought of to weaken the force of the demonstration we shall be only too glad to have it pointed out. On the other hand we expect as a matter of simple fairness and justice that candid scientists will acknowledge its force if they shall finally regard it as unanswerable.

A SUM IN SIMPLE ADDITION.

IF we now have on our books the names of 13,000 subscribers, and if each subscriber should obtain one additional name, we would then have 26,000. Or if some of our subscribers should not be able to obtain one additional name, and others should send us two, three, or more, so as to make it average one subscriber each, the result, mathematically, would be the same. Q. E. D. Now we believe that all this could easily be done, and that the influence of *THE MICROCOSM* for doing good could thus be doubled, if our readers felt the same interest in extending the circulation of this Magazine as we feel in preparing it. Possibly they do. If so, let them try the experiment, and the result can hardly be doubted. Who will first respond to this call?

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FOSTER'S SPIRITUALISM.

BY COL. JOHN M. PATTON.

Articles like Capt. Carter's in exposure of Spiritualism (so-called) and of Fosterism in particular, are, I suppose, necessary, in view of the fact that in the dense population of the North and West, many kinds of *isms* are rife and ruinous. It does seem strange however that such unmitigated nonsense as *Foxism*, *Fosterism*, *Sladeism*, *et id genus omne*, should not merely have found fast foothold *anywhere*, but should have become even a religion with many. That it should have clouded for a time such sudden blazing lights as the manifold Boston lecturer—Cook—might have been expected; but that it should have shaken the faith of some sound thinkers is, to say the least of it, very strange.

I can add an incident to those detailed by Capt. Carter in further exposure of that charlatan Foster—of whom Robert Dale Owen spoke in his "Foot-prints on the boundaries of two worlds" (or some such title. I have not the book on hand) as the greatest medium of his particular kind in the whole world.

About twelve years ago a prominent lawyer of my acquaintance was a guest at my house. We sat up talking 'till a late hour at night. Among other things our discourse turned on Spiritualism. He told me of some wonderful phenomena exhibited by Foster to two of our legal friends at different times which had baffled them and him. Among other things he stated that Foster, after requiring the names of dead persons to be written on little parallelograms of paper (folded and then crushed into pellets), had described accurately (as present in spirit form) the wife of one of these gentlemen, even to peculiarities of her appearance which rendered her identity unmistakable; and that on being asked for the name, he had shown it written in full in bluish letters on his arm, which gradually faded away. He did the same thing in regard to two children of one of these gentlemen, with this remarkable addition, as it was said, that when the names were called for they appeared thus—Mary Blank.

Annie } Blank.
Eliza }

(These are not real names of course, but are assumed to avoid identification.) The facts about the child with the double name—of course unknown to Foster except spiritually (!), were said to be, that when the child was born, the parents had named it Annie, but before the christening of the child, they had changed it to Eliza. I was given to understand, or at least understood, that in all this Foster had not handled these pellets, and that the names he announced appeared in full on his arm, or were pronounced in full by him. I afterwards talked with one of the gentlemen concerned, on this subject, and he confirmed these statements.

My reply to these statements was that I did not accept any one of them as a fact, and could not do so unless I should witness them for myself so often and under such a variety

of circumstances as to exclude the possibility of deception—while I did not doubt that these gentlemen believed them to be facts themselves or, at least, could not explain them otherwise. That if I should hereafter be compelled to accept them as facts, I should have to account for them on *some* theory, for there is nothing to do with a *fact*, but to accept and account for it. That if it were a fact that spirits interfered in the affairs of this world in a manner so light, useless, absurd or pernicious, as did those introduced by Foster and his tribe, I should suppose them to be trifling or diabolical spirits, accordingly as the fruit of their appearances might indicate: while, at the same time, I would not deny that God had and might now, as of old, send spirits to earth, to execute his own beneficent ends. Finally I said that when I next went to New York, I should certainly visit Foster, and observe for myself the alleged phenomena; for I desired the truth wherever it might be found, and was willing to receive it from Foster if he had it; accordingly, not long after, I called on him in New York.

In visiting Foster I was mindful of a concurrence with Sir Walter Scott's remark, in a similar connection, that "it often happens, such is our own natural love for the marvelous, that we willingly contribute our own efforts to beguile our better judgments"—a thing which I thought my friends had done, and which I resolved to avoid, if possible. I therefore endeavored to discover Foster's mode of action, and, in advance, laid down the following as probable. In spite of the impressions derived from my friends, I thought it probable that he would handle the pellets, and that perhaps he was endowed with an exquisite delicacy of touch, which, cultivated to the utmost, as in the case of the blind, would enable him, if he handled the pellets, to discover more or less of their contents. Again, I thought it probable that he was a very close observer, and that by long practice in such observation, he might detect, and more or less correctly interpret, the slightest unconscious signs of interest, emotion, or even thought, on the part of his visitors. I resolved, therefore, to guard these points.

When introduced into his ante-room, I was told that he was engaged in *seance*, but would receive me in a few minutes. In a short time a young couple, who seemed to be either lovers, or a bride and groom, emerged sufficiently solemn and awe-stricken. Immediately on going in I wrote names of dead friends on the papers lying abundantly on the table, taking the precaution to write behind my hat, and to bear as lightly on the paper with a soft lead-pencil, as was consistent with its being plainly legible. This tribute I paid to his supposed delicacy of touch. As each paper was written, I folded it on itself twice, and then rolled it between my fingers in the shape of a pill. The name written on one of these papers was my father's, whose name-sake I was. On another was the name of a lady. On a third and fourth were the names of two brothers who were killed

during the late war between the States. As soon as I had finished the pills, he took them, as I had suspected he would do,—sweeping them all before him with his hand—and then reduced them from the pill shape to the double fold which I had given them. These he commenced running through his fingers, and placing on his eyes and forehead, joining the ends of his fore-fingers at the centre of each paper and drawing them away toward its ends. This he did many times. He then said “there is a spirit present.” “What is the name?” I asked. “J. M. P.” he replied. I asked for the full name. He said he could not give it. I stated that I understood he pronounced or wrote the full name. He replied that he did sometimes, when the spirits impressed him strongly (which, being interpreted means—when the lead-pencil is strongly impressed.) I asked him what disease had caused the death. He said I must write the names of diseases on a paper—as many as I pleased—the only condition being that the real disease that caused the death must be among them. This reminded me of tricks of cards, and of mind-reading, by which our children are amused in our parlors. I told him I had been informed that he not only described the person of the spirit, but that he uttered all information he possessed, without such aids. He told me I was misinformed, and that he always did it in this way. I wrote down a number of diseases before him, among them *cerebro spinal meningitis*, then making a great noise in the world. He requested me to hold the pencil lightly in my fingers, and pass it slowly down over the names of diseases which I had written, adding that the spirit would, through the pencil, indicate the true disease. I was mindful that he was watching me closely, and that it was likely that one having a particular name in his mind, might very easily indicate it, under the circumstances, by a slight, even unconscious movement of the pencil. I therefore resolved to dismiss the true disease from my mind, as far as practicable. The pencil was moved slowly down the list without result. He asked me to repeat it again and again. At last when the pencil, after these repeated experiments, passed over the long-named disease I have mentioned, he exclaimed triumphantly “that is it, that is it.” I assured him he was mistaken. The same process was gone through with—he sometimes holding the pencil himself—until he had guessed erroneously various diseases. He then confessed, with evident chagrin that this experiment was a failure. After a little pause, during which he was apparently looking into the distance, he turned to me and said “Ah! I have it;” and, suiting his actions to his words, sinking gradually in his chair in a languid way, he said, while raising his hands and moving them gently down again, “He died of a sort of a sinking—ah!—a sort of a giving away.” I replied that he did not so die, except in so far as his description was applicable to most deaths. Precisely the same failures occurred to guess correctly the battle in which one of my brothers died. I had not the heart to go further through such mummery, in the case of my other brother. When he stated that the female spirit was present, and I had asked for the name, he replied “I will see if she will give it to you,” and pressing up the sleeve of his fore-arm he thrust it under the table and on drawing it forth, after a little space, there

appeared her initials in rude bluish letters on his arm. Capt. Carter has, no doubt, correctly explained the method of producing this effect.

He repeatedly confessed, after his various experiments that the *seance* was a failure, in which I agreed with him. We then sat a few moments in silence—I meditating a retreat and the mode of it, and he, apparently thinking of his mortifying failure. I had almost become unconscious of his presence, pursuing some thought suggested by the occasion, when suddenly as the lightening flash, and with a loud exclamation, he turned in his chair and stamped violently on the floor, pointing with his finger, and gazing, apparently under great excitement, at a point about two feet from my right shoulder. “There! there! t-h-e-r-e!!” said he—“a female spirit, a beautiful female spirit is at your side.” Such a dramatic display as this was well calculated to shake one’s nerves, and to excite the imagination, as he, no doubt, calculated it would do; but it so happened that I remained as calm as I am at this moment. He asked me then if I desired to communicate with this spirit. I replied that I was quite willing to do so. He then informed me that if she would gratify me I would be assured of it by raps upon the table. He then asked—“Spirit will you communicate with the gentleman?” The raps sounded. “Did you hear the raps?” he asked. “Distinctly,” said I. “Perhaps,” said he, “she will touch you. Would you like to be touched by her?” I replied “I have no objection.” He then plead with the spirit. In a gentle voice he said, “spirit will you touch the gentleman? Spirit *do* touch the gentleman. Spirit, the gentleman *desires* you to touch him.” Then turning to me, he asked me if I felt any touch. “None whatever” said I. This effort he repeated over and over again, as if he really expected me to feel the touch, but I could not feel it. He then gave up in despair that object, and proceeded to describe the lady, hoping, no doubt, that after that description, I would feel *touched*. He said she was a lovely young creature whose sorrows had been great; that both her later life and her death had been sad; and then, lowering his voice and speaking very pathetically, he said, “She died in childhood, do you know the lady?” It was now evident to me, though I could not imagine why, that he took me for one who at some time had “stained the virgin’s years.” With a conscience, thank God, entirely clear, I answered, “I never in my life knew such a lady.” This finished him. He rose from his seat, and said again, what he had so often said before, “Well, I must confess I have failed to-day. The spirits do not impress me strongly sometimes. I am not always in a receptive condition. Pray come again and it may be better.” He then stated something about his being distracted that day by the fact that he was moving his quarters to another place, and it was natural that he should not be in a proper condition.

I arose, paid him my five dollars, and left him with the conviction that he was a most pernicious knave; and that even considered as a juggler, he was the most impudent and unmitigated humbug I had ever seen.

Any person sending us five names for Vol. 3, with the money (\$5), will receive by mail a beautiful bound copy of volumes 1 and 2 in one book as a premium, price \$2.50. (See third page of cover.

**THE WATERS ABOVE THE FIRMAMENT,
OR THE EARTH'S ANNULAR SYSTEM.—
NO. 3.**

BY PROF. I. N. VAIL.

Any one who has read attentively my article on the "*Waters above the Firmament*," in the June and September numbers of the *Microcosm*, as well as Prof. Slingerland's synopsis thereof, cannot fail to see that the annular theory when once established, becomes a final and glorious victory of the book of Genesis over the leagued despots of science. It shows conclusively, above all doubt, that the deluge,—the very rock upon which the Christian world has wrecked—so far from being an impossibility, was an utter necessity born of the very laws of God and Nature, and shows that the authenticity of that remarkable narrative is planted upon a foundation immutable as adamant, and against which the rude surges of infidelity will ever beat in vain. I desire therefore that every reader of these papers may be convinced of the validity of my claim, before we go deeper in this interesting field of thought, and I will then in this article merely summarize in a more familiar form the evidence heretofore presented, so that every child must understand it.

First let it be remembered that every link of evidence is drawn from the great store-house of philosophic facts: thus meeting infidelity on its own chosen ground.

Surely every student of Nature *knows* that there was a time when the oceans that now wash the shores of the world did not exist on its surface, and must therefore have *fallen to it, in some manner*. Now my claim is a purely reasonable one before any evidence whatever is presented in its defense; that those waters did not all fall in primitive times, and when I open my bible and find evidence unimpeachable, pointing with unerring certainty to the fact that some of these waters fell in the days of Noah, I am emboldened to announce my claim to the world. I know full well it begins a struggle, but the hand of God is in it, and must go on to the end.

Every one has learned in his school days, that if the earth should rotate once in 1 h 24 min. and 29 sec., or 17 times as rapidly as it now does, objects on the equator would weigh *nothing*. That is, if the earth at the equator moved but little more than 17,000 miles per hour in its rotation, those objects would fly off into the atmosphere, just as water will fly from the perimeter of a rotating wheel. It is readily understood then that any matter solid, liquid or gaseous, moving but little more than 17,000 miles per hour near the earth's surface *must rise from it* and move around it, at a distance answering its condition of velocity and centripetal force. This is certainly within the grasp of every mind. If that matter then should have a velocity much more than 17,000 miles per hour, it would rise *much farther* from the earth and would continue to revolve in an independent orbit, and gradually return toward the earth as its velocity decreased. *This is law that any one can understand*. But the matter in the primeval atmosphere *did move much more* than 17,000 miles per hour. In an atmosphere 100,000 miles deep (not half the depth claimed by astronomers and physicists) the aqueous matter at that height moved with the velocity

of 25,000 miles per hour, as any one familiar with calculation can prove. That matter therefore could not upon condensing fall to the earth, for if moving with that velocity *near* the earth's surface it would immediately *rise from it into its appropriate orbit*. If any one denies this conclusion, he inevitably denies that the earth rotates once in 24 hours, while it is the conclusion of the most eminent mathematicians that it revolved much more rapidly than that. Then it must be evident to any philosophical mind that the primeval vapors kept away from the earth by its native heat *did not and could not fall to the earth in primeval time*. If any man will deny this he must stand convicted before the inexorable bar of philosophy.

The conclusion then is plain, that none of the aqueous matter of the ancient atmosphere having a greater velocity than 17,000 miles per hour could fall, while vapors near enough to the earth may have fallen, upon becoming condensed. Thus leaving a great fund of vapors revolving about the earth and *far above it*! This would be the case if the atmosphere were reduced to its present limits, by condensation, leaving a ring of vapor or aqueous matter revolving as Saturn's rings now do; and whether the latter be solid, liquid or meteoric, the *earth's ring was aqueous*, to a large extent.

Now we are not treating of *solid* matter as earth or rock, but of aqueous vapors; and as clouds *now* float in our atmosphere, where the rotative velocity of the earth is much less than 1,000 miles per hour, and float none the less, it is evident that a velocity of even two or three thousand miles per hour would cause them to float much higher or farther from the earth's surface, so that whether the primeval atmosphere was 100,000 miles deep or not the one tenth that deep the inevitable tendency of the primitive vapors was to remain revolving, or floating in the very outermost boundary of the atmosphere, long after their rotary velocity was reduced below 17,000 miles per hour.

Now since it is a demonstrated fact, that the vapors from which our oceans were condensed remained for unknown ages revolving about the earth, the only remaining question needed to settle the annular theory forever, is: How long did they continue to revolve about the earth? Philosophic law *impels* us thus far, we will see how much farther. We will still follow its dictates through the mysteries of Genesis, and if there is any thing at all in evidence, we will be forced to admit that these aqueous vapors remained above until after man came upon the earth. I open my bible and read on its very first page the simple and positive announcement that they did remain there and were familiar to the man that penned it. "*And God made the firmament (atmosphere) and divided the waters which were under the firmament from the waters which were above the firmament and it was so!*" [Gen. I. 7.] And I say if "it was so" science settles the question at once and forever; that they revolved about the earth; for they could not otherwise have stayed there for any length of time. But if such a fund of vapors did exist there, in their declension they would spread from the equator to the poles, as shown in a former article, and the sun's direct light and heat would be cut off from the earth's surface, and there would be light in the heavens before the sun could be seen. Such as is now seen when the sun is hidden by clouds. "And God

said 'let there be light and there was light,' and yet a sun was not seen; now it is scarcely necessary for me to say that if "there was light" before the sun appeared it is proof that there were vapors overcanopying the earth. Thus we are told there were waters above the firmament and then the writer *unintentionally* proves it by saying "there was light" before the sun appeared! Here again is *philosophic law*! But let us prove it again. If those vapors overcanopied the earth, and thus cut off the direct rays of the sun, then there could not be rains nor storms such as we now have. But what does the penman say? "For the Lord God had not caused it to rain on the earth, but there went up a mist and watered the whole face of the ground" (the whole earth). It certainly will not be demanded by a philosopher, that I should prove that if there was a time in the antediluvian world when it *did not rain*, etc. that the sun's direct heat did not reach the earth's surface, *since it is self-evident*. Thus the historian unwittingly proves it again. It is certainly plain, that if the sun's rays could not reach the earth's surface there could be no rains, for there could be no winds and storms, and the first wind could come only after the atmosphere or firmament was cleared of its vapors and the sun could shine down upon the earth—after the waters above the firmament had descended. What is most remarkable then is the simple announcement that at the very time the waters ceased to fall, when the "rain from heaven was restrained" "God made a wind to pass over the earth and the waters were assuaged." The first wind mentioned! doubtless the first man ever saw! came after the rain! came according to philosophic law! whereas the wind must philosophically precede the rain so long as the sun's light can reach the earth. Now we may look at this in every light it is capable of, and we can only come to the conclusion that the inspired penman unintentionally testifies that before the flood a great fund of vapors did overcanopy the earth! That there were "waters above the firmament,"—and their fall let the sun shine on the earth to cause wind. But let us prove it again. The inspired penman tells us there was an Eden so warm that the human race dwelt naked therein, that all animals and all manner of trees grew therein; that there was perpetual life and bloom therein. Then that Eden was the world and possessed a green house climate, and such a condition of things could not have obtained if the sun's heat descended directly upon the earth's surface,—if the earth had not such a green house covering! as the waters above the firmament was competent to make. What means this harmonious testimony? But the whole Edenic narrative is replete from beginning to end with just such links of evidence, so that under the light of the Annular Theory almost every mystery vanishes. (But I digress, I will give it all to the world in the fullness of time God permitting.) We will return to prove it again. In the six hundredth year of Noah's life in the second month the 17th day of the month the same day were all the fountains of the Great Deep broken up * * * and the rain was on the earth forty days and forty nights, * * * and all flesh died, * * * both man and cattle and creeping things and the fowl of the heaven * * and every living substance was destroyed." (Gen. VII.) Will any sane man claim that this was a natural rain from the

clouds in our atmosphere? The emphatic verdict of philosophy is, that it could not and did not come thence! Then it came from revolving vapors beyond the clouds—from "waters above the firmament," for there is no other possible source! Now the inspired penman was not intending to prove by this narrative, that the primeval vapors continued to revolve about the earth until after man came upon it, and yet he does prove it, if there is anything at all in evidence. Now out of a multitude of witnesses which I have kept as a reserve force in case of emergency I will present one though not the strongest one.

The writer of Genesis states that the rainbow appeared after the deluge, and of course the inference is plain that it did not appear before the flood. Then we have in this a positive proof that the sun did not shine down upon the earth during the age of antediluvian man. It is positive proof that the deluge was a descent of exterior vapors, and this proof is more positive and emphatic from the very fact that the person who wrote the account did not know that it was such proof. It is this peculiar force of testimony that is destined, I must say with diffidence, to shake the world. I have not given a tenth part of the evidence I have in manuscript form—evidence gleaned from the book of nature through twenty years of incessant toil, but I will now retire temporarily from the field, or, until I have sufficient evidence that my readers in general and the editor of the *Microcosm* in particular are satisfied that I have substantiated my claim, that the primeval vapors expelled from the heated earth remained, above in part at least and revolved about it until after the advent of man. All of which is respectfully submitted.

BARNSVILLE, OHIO.

SCIENCE AND THE CLERGY.

BY REV. F. HAMLIN.

The Christian minister is God's messenger to a sin-cursed world. His mission is "to turn men from darkness to light, and from the power of sin and Satan unto God." Beholding the race, bewildered and in chains,

"His spirit yearns to bring
The lost ones back—yearns with desire intense,
And struggles hard to wring
Sin's bolts apart, and pluck the Captives thence"

But in his efforts to rescue men from present and future danger, what is his relation to scientific investigation, theory, and discussion? Shall the divinely called teachers in this and other lands be simply "a cloud of witnesses" a battalion of idle spectators, held in check by a fear lest they will be imputed ignorant, and constantly reminded of the "persecutions of Gallileo"?—If Virchow's declaration were true that "science and faith exclude each other" then might the Christian teacher confine himself exclusively to the domain of pure theological discussion. But if you please, the sphere of truth in this world is indivisible. God's word is but the Divine addenda to God's works, and each is now fully understood in the light of the other. And further, it is unreasonable to demand silence on the part of Christian ministers when evidently most of the so-called

"Science" of our day seeks to undermine Revelation, and unsettle the minds of men on the great questions regarding the soul, and its immortality. Therefore though Büchner may declare that "theologians must be left to themselves with their articles of faith, and naturalists to themselves with their science," and though as the Duke of Argyll (Reign of Law) tells us "some men of theology come out to parley with the men of science—with a *white flag in their hand*—saying, "if you will let us alone we will do the same by you," we hold that in this age when "principalities and powers" conspire to supplant a heaven-given Christianity by a hell-given infidelity, every Christian minister is under obligation to protect *true Science* against the corruptions of every "new philosophy" which substitutes speculation for principle, and fiction for fact. *In the interest of truth and righteousness we insist that every minister of the Gospel should read as broadly as possible on scientific questions, etc.,—thus, and thus only will he know the truth, and possess*

"Thoughts where very sweetness yieldeth proof
That they were born for immortality."

No man is more inconsistent than he who (claiming to be a sincere searcher after truth) accepts and teaches a scientific theory, and yet refuses to read a work which pretends to refute it even when 6,000 clergymen, and 24,000 intelligent laymen by "actions" which "speak louder than words" declare that the argument is worthy of his consideration; nor does it render his inconsistency less glaring and disgusting if he be a Christian minister, and the refutation if true is strongly corroborative of the strict philological teachings of the book of Genesis. Of every Beecher who thus tramples upon productions of Christian scholars, lest their faith in skeptical authors may be shaken, it may truthfully be said: "to him that knoweth to do good, and doeth it not, to him it is sin."

We hold it to be in the highest degree reasonable and right that McCosh, and Cook, and Professor Gray and all ministers of the Gospel should carefully read *both sides* of every scientific question which commands their attention, for only thus can they reach correct conclusions. Then too they should expose all errors thus discovered (especially those of skeptical writers) and thus promote the spread of truth and righteousness. If the Christian minister should be ever on the alert to expose false doctrines, then surely he should be equally on the "qui vive" to expose all scientific errors which relate directly or indirectly to the teachings of Scripture. And this for two reasons: First, because to release a truth is to prophesy its ultimate victory. Said blind John Milton, "Though all the winds of Doctrine were let loose to play upon the earth, so *Truth* be in the field, we do *injuriously* by licensing and prohibiting her. Let her and Falsehood grapple. Whoever knew truth *put to the worse* in a free and open encounter?" And second, because it will influence the young of our land in the direction of *Christly teachings, and Christly living*. Who has not observed that multitudes of the young men of America are being unsettled in their theological views by the fact that some so-called great men are skeptics? We must all admit that "No man who thoroughly accepts a principle in the philosophy of Nature which he feels to be inconsistent with a doctrine of reli-

gion, can help having his belief in that doctrine shaken and undermined." Now that the Doctrines of Development and spontaneous generation have this tendency is evident not only from the rejoicing of infidelity at their first announcement, and the clearly logical argument of Haeckel based upon them in favor of Atheism, but also from the almost universal skepticism which immediately follows the espousal of any type of either theory. How could Doctor McCosh do better work for God than to show to the thousands in America who are influenced by his teachings from the Hebrew Scriptures that Gen 1, 21 and 27 in the fact that the verbs are identical in meaning necessarily proves the Darwinian theory false and that therefore Haeckel is erroneous in his opinion? Let him do that and the confidence of thousands in the opinions and judgment of Haeckel will be destroyed, and thus *Atheism* as well as false Science will receive a stunning blow; for intelligent men will say, "if he err thus in the field of the 'seen,' we must not trust him in the sphere of the unseen," for "the things which are seen are temporal, while the things that are unseen are eternal." And if we mistake not Joseph Cook could from his Boston platform fire a shot that would be heard around the world. Let him strike Materialism by showing the truthlessness of the wave-theory of sound, (Hall's "Problem" will furnish him points) and he will so fully reveal to the world the weakness of Professor Tyndall that we shall hear no more of young men's disbelief in prayer, because the great Englishman will be, so far as his views for this generation are concerned, speedily consigned to merited oblivion. And if they will not do this, then Cook and McCosh owe it to themselves and to the rising generation to meet the objections recently made, and so rapidly gaining credence against the theories which they respectively advocate. In any event let the clergy of this land *teach and be governed* in their pulpit treatment of scientific subjects by that which Dr. McCosh has thus far only taught in this connection; namely, that "the relation between revelation and facts is one thing; and the relation between revelation and theories another thing"—and that "while acknowledging their obligation to admit undeniable facts, theologians are at liberty to receive or reject the theories deduced from those facts. Such theories are human speculations and can have no higher authority than their own inherent probability." "Theories are of men. Facts are of God. The Bible often contradicts the former, never the latter." This ground Religion will not surrender, and if it cannot sustain itself by the clear and consistent doctrines of the Bible, it must take the field, and through the clergy fight the battle with the weapons of Science and Philosophy, with those *facts* which the God of Nature has provided for His ultimate triumph.

POUGHKEEPSIE, N. Y.

THE LAWS OF MIND.—NO. 6.

BY REV. J. W. ROBERTS.

Let the reader keep in mind these axiomatic propositions, which are here repeated to have them fresh in the memory:

1. *Out of nothing nothing can come; or in other words, Out of nothing something cannot come.*

2. *Out of something nothing can come which that something does not possess.*

3. *No effect can be greater than its cause.*

These propositions being self evident will not be called in question by any one who can think logically or philosophically. At the first reading the second one may cause a moment's hesitation because it seems to strike a fatal blow at material progression; but the briefest reflection will show that in substance it is identical with, and but a repetition in another form of the first one, which is universally accepted as true by all men who claim to know even the rudiments of science. If out of something that can come which was no inherent part of it before, then to all intents and purposes it is just that far and to that extent, bringing something out of nothing. This is too plain to require elaboration; as well reason on any other axiom.

That this great principle is far-reaching, and overthrows many systems of human ingenuity, the pride of mighty intellects, cannot be questioned or helped; nor will the true searcher after truth care for these results; for his own purpose is to know what is fact and what is fiction. Truth makes no compromises. In one sense she is pitiless; for in her stately and majestic march, she pauses not to consult with error, which is often crushed beneath her ponderous chariot wheels. She points the way with unerring finger, and if we but understand aright our feet may with safety and assurance tread her royal highway, nor fear that she will ever lead astray. We get befogged only when we "lean to our own understanding" and permit error or prejudice to becloud our vision and scatter mist along our pathway. Truth is always lustrous, and we only get into shadows when we pass from the realm of her shining light.

As matter is absolutely helpless and possesses no element of progress or intelligence, it is not only unphilosophical but positively absurd to attribute any kind or degree of development to it. Nothing produces or develops nothing. All systems and theories which are predicated upon the potency of matter must fall, as they are necessarily false. It makes no difference by what name these systems or theories are baptized, whether Evolution, Progression, Potency of Matter or other high-sounding terms, they must all perish of inherent weakness. A house built upon the sand cannot abide when the storms beat against it. To evolve something out of matter which matter does not possess is the same old scientific heresy of bringing something out of nothing, which has so long been rejected and trodden under the feet of scientific men.

Life and intelligence exist on every side. Whence came they? They are the potential entities which environ us and whose touch thrills the universe. Out of these proceed action and progression. Whence? Ah, that is the profound problem which to-day, as in all the past, stands face to face with us.

Whence am I? What am I? Whither go I? These are the queries with which the philosophers of all ages have wrestled, and by which all have been conquered whose time of investigation was limited to material things. They who attempt to evolve something from the things which do not possess that something must always fail from the inexorable necessities of their environments. It is always wise to accept the inevitable.

The impotency of matter as a producer or developer having been demonstrated, we are compelled to look elsewhere for a solution of this mystery which confronts us.

At the outset of these inquiries it was stated that there are three entities in Nature, matter, substance, and mind or spirit. What is substance, and what are its properties?

Substance is their entity in Nature which is neither gross matter nor refined mind. Its properties are so little known beyond the names given them that these will probably convey as correct an idea of what it is as can be given. We know the substance connected with matter by these names: Gravity, electricity, magnetism, light, heat, cold,* and possibly some others. Of these gravity and cold appear to approximate independence of pure matter more nearly than any others; and yet their association with matter is of such a character that we have no knowledge of them in an entirely independent capacity.

It would be pleasant, and possibly profitable, to enter upon an investigation of the properties of substance, as far as we are cognizant of the same, but the aim of these papers point another way, and for the present this field of inquiry cannot be occupied.

Substance, like matter, is devoid of life and intelligence, and hence cannot impart these qualities and we are compelled to find their origin in some other direction.

They could not come out of nothing. They could not proceed from something destitute of them.

They could not have their origin in anything less than themselves.

The cause which produced them must be efficient, active and adequate.

As they proceed from something that something must be the source or fountain of life and intelligence.

These propositions are scientific axioms which cannot be called in question. It matters not where they lead us. If we are honest *truth* is the object of our search, and where truth is found there we should abide, not sullenly as if with reluctance we were driven to accept her mandates, but with cheerful delight, glad to rest in the shadow of her divine presence.

Analytical chemistry has done much to develop the processes of life, in connection with other researches; but when the cell or cells, or other ends, are reached, which may or may not be the receptacles of the germs of potency, the problem of the origin of life is just as far from solution as when the first step in the investigation was taken. The great Unknown still sketches out in unmeasured and unsearchable mystery, a vast and unfathomable ocean, beyond the grasp or comprehension of the most subtle intellect; and the laboratories of the scientific world are covered with the ashes of their own impotency as they rest in the presence of this confronted but unexplorable mystery.

That mind exists and that it is not governed by the laws of the material universe are facts which experience proves, if they are not clearly self-evident. The theory of some writers, whose chief aim is to "put God out of their

*The editor of the *Microcosm* has had in his possession for months awaiting room for publication, an article from the writer on "Cold and Heat," which shows conclusively that the notion that cold is a mere negative or the absence of heat is an impossible absurdity.

thoughts," that mind is matter of an ethereal character, is begging the question without relieving it of a single difficulty; for it is philosophically just as impossible to explain the origin of their fancied ethereal matter as to demonstrate the source of mind. Nothing is ever gained in any investigation by disingenuous evasions of unexplainable difficulties, or the denial of palpable facts, while such a course is sure to throw distrust upon the honesty of purpose and motive of him who resorts to such methods. No theory is worth holding, defending or promulgating which requires shuffling or equivocation. The goal of every aim should be the acquisition of truth. To be wrong is to do one's self harm; to defend wrong is to harm others. Truth is constructive; error is destructive.

"Like produces like" is a universal law of Nature. Therefore life must be produced by life, and intelligence by intelligence. It is not material what name we give this Source, the essence is the same. That incomprehensible mystery surrounds this Fountain of life and being is admitted; but mystery is one of the environments of everything of which we have any knowledge. It envelops us as an impenetrable cloud and bars our vision on every side. From the blade of grass that we heedlessly tread beneath our feet up through the trembling leaf, the floating cloud, the azure sky to the sparkling worlds that "glitter on the arch of night"—all is full of mystery. But while the phenomena about us are unexplainable they are not unreasonable. While we cannot comprehend our surroundings, we cannot deny their existence. While we are profoundly unknown to ourselves yet we cannot deny that we are. Around, beneath, above, we behold the evident workmanship of a master-mind; and from these indisputable evidences we know that that Mind exists, just as certainly as we know that man made the pyramids, though their origin is enveloped in obscurity.

This process of reasoning is no *ignis fatuus* leading us into bogs and quicksands, but a steady and enduring light which guides us safely and surely to a haven of repose where we can cast anchor and rest in perfect security. That Source of life and intelligence we cannot comprehend, as we can comprehend no ultimate in nature; but we know it exists as surely as we know when we see a house that there is a builder, or a stream that there is a fountain.

Having reached this point and this paper being too long to admit of elaborating a new proposition, the reader must wait until next month for further developments of the theme under consideration.

THE SOUND CONTROVERSY.

BY PROF. I. L. KEPHART, A. M.

It was during the winter of 1878-9 that I first read that wonderful book, "Wilford's" *Problem of Human Life*. To say that I was interested would be putting it very mild. Every page, almost every sentence, was replete with matter for reflection. Many portions of it I read and re-read the second and third time. The discussion of the wave-theory of sound was of absorbing interest to me. The attack

was so sudden, unlooked for, and bold, the chain of reasoning so strong, the facts and demonstrations apparently so incontrovertable, that I could but ask myself, "what will eminent physicists say?" Having carefully examined the entire argument over and over, it seemed in my judgment, so conclusive that I was fully convinced that the wave-theory, as I understood it and had taught it for years, was as much an error as was the Ptolemaic system of Astronomy. This was my conclusion, and for the encouragement of honest investigation, I so wrote the author, although I had no knowledge of who the then "Wilford" really was.

Since then, and especially since the birth of the *Microcosm*, I have been a silent but deeply interested observer of what has been said on the wave-theory both pro and con. I had hoped that some one of the renowned authors—Tyndall, Helmholtz and Mayer—would reply to the book that had so terribly pulverized their theory, and either expose its errors or admit its conclusions. But this hope has not been realized. However, some new interest has been awakened on the subject by the attempts of lesser lights to break the force of "Wilford's" assault and to defend the wave-theory, prominent among which is the recent effort of Professor Stahr in the *Reformed Quarterly Review*. But instead of these attempts annihilating "Wilford" and vindicating the wave-theory, they have only afforded Dr. Hall additional opportunities for laying bare the absurdities into which the defenders of that theory have necessarily involved themselves, and for more clearly demonstrating the reasonableness and conclusiveness of the doctrine of *Substantialism*.

Especially is this the case with Prof. Stahr's late attempt. He defines thus: "*Sound is really a sensation, that is, the impression made through the ear and brain upon the mind;*" and in doing so, completely gives away the whole wave-theory. This, such an acute observer as Dr. Hall is not slow to see, and in his reply No. 2, in the Oct. *Microcosm*, he takes this monster club so innocently placed in his hands by the Professor of Physics in Franklin and Marshall College and with his herculean blows beats the brains out of the theory the valiant Stahr is trying to defend. A more complete annihilation of an opponent with his own weapon I have never read than is found in this part of the Doctor's reply.

But for the consolation of the vanquished, I would here state that he is not the only one who has blundered in defining sound, to the extent of sometimes putting the effect for the cause and *vice versa*. Even so renowned an author as Dr. Tyndall is badly mixed on this very point. In his "*Lectures on Sound, third edition, revised and enlarged*" page 32, in defining Sound, he says: "It is the motion imparted to this, the *auditory nerve*, which, in the brain, is translated into sound." Dr. Hall's telling blows in reply to Professor Stahr's definition, fall with equal force on this one. And again, on pages 33-4, he says: "This membrane" (*the tympanum*) "which closes outwardly the 'drum' of the ear, is thrown into vibration, its motion is transmitted to the ends of the auditory nerve, and afterward along that nerve to the brain, where the vibrations are translated into sound." (*Italics mine.*) "How it is that the motion of the nervous matter can thus excite the consciousness of sound is a mys-

tery which the human mind cannot fathom."

Now let fair-minded thinkers read these definitions of sound, and then read Dr. Hall's reply to Prof. Stahr in the October MICROCOSM, and they will see how completely he has laid out not only that Professor, but also Prof. Tyndall. According to these definitions, sound only exists where there are ears, auditory nerves and brains. Outside of ears there may be motion, but there can be no sound. As well might we assume, as Dr. Hall shows, that there are no odors where there are no noses; no light, where there are no eyes. By the same reasoning there is no electricity where there are no sensible objects to receive and be impressed by its shock, and no gravity in space where there are no objects to be influenced by it. Is it strange that thinking men are dropping the wave-theory, when seeing its exponents agree upon definitions that lead to such absurd conclusions?

But Tyndall is not consistent. He is not true to his own definition; for near the bottom of page 34, in an attempt at illustrating his idea of the transmission of sound he says: "Thus, also, we send sound through the air, and shake the drum of the distant ear, while each particular particle of the air concerned in the transmission of the pulse makes only a small oscillation." Here, according to this renowned author, sound is a something sent out through the air by the sounding body, the air being only the medium of its transmission. This accords so exactly with Dr. Hall's theory of Substantial sonorous corpuscles, that it looks as if the renowned apostle of the wave-theory had turned a complete somersault. As above quoted, there is no sound outside of the ear. There are only vibrations which, in the brain, "are translated into sound;" but here sound is a real something which is transmitted through the air. The author seems to be hopelessly mixed up between actual sound and the transmission of sound, sometimes, in his illustrations, putting the mode of transmission for the thing transmitted, and *vice versa*. All this is doubtless the result of his adherence to the wave-theory which is too incongruous ever to be consistent with itself.

But the finishing blow to this theory is dealt by Dr. Hall in his reply to Prof. Stahr, where he demonstrates by a new method of measurement "that a tuning-fork will actually sound audibly, held in the fingers, when its prongs are traveling to and fro only at a velocity of *one-third of an inch in an hour!*" How such a rate of travel is to send off air-waves at the velocity of sound (1,120 feet in a second) is what professors of physics are now asked to explain, and this is what readers of THE MICROCOSM will, with considerable anxiety, wait for. Will Prof. Stahr now come forward and make this matter plain to their "unscientific" minds? If he will obligate himself to undertake the task in *The Reformed Quarterly Review*, for January, as the Editor of THE MICROCOSM urges him to do, and will so announce to the readers of that magazine, the publishers of the *Quarterly* can safely count on the sale of not less than 2,000 extra copies of that issue; for I am very sure that there are more than that number among the readers of THE MICROCOSM who would gladly invest the price of a copy for the sake of seeing the error (if such there be) in Dr. Hall's demonstration pointed out. What those readers want is the simple truth, no matter whose theory it maintains or overthrows. A theory that the facts of the material universe will not support, deserves to fall. The readers of THE MICROCOSM subscribe to no pet ideas in science and philosophy that cannot be

shown to be in exact harmony with the physical laws of Nature. And hence they will not be apt to subscribe to a mere theory, however high the authorities who support and teach it, which requires them to believe that a tuning-fork's prong moving at a velocity of less than an inch in an hour—slower than the hour-hand of a clock—will drive off air-waves at a velocity of 1,120 feet in a second. For this reason the Editor invites the attention of Prof. Stahr, and of professors everywhere, to that final demonstration against the wave-theory. Indeed Prof. Stahr must either respond to this call and answer this demonstration, or else confess publicly that the wave-theory has broken down. Prof. Huxley, correctly tells us that one single fact, if *positively opposed* to a hypothesis, will be sufficient to break it down, however many facts may seem to support it; and, he adds, that one such opposing fact is as good as "five hundred;"—"Such hypothesis must fall to the ground." *Lectures on the Origin of Species*, p. 140. Can Prof. Stahr show this one demonstration to agree with the teachings of the text-books on acoustics? If he can not do it, and still refuses to give up the theory, after so confidently attacking the new departure, his days, as a candid scientist, are numbered.

In view of the work now progressing in THE MICROCOSM, all lovers of truth owe a lasting debt of gratitude to the Editor of that magazine and the author of the *Problem of Human Life*. He has awakened more earnest thought on scientific and philosophical questions that pertain to the present advancement of human knowledge and the future welfare of mankind than any other investigator for the past quarter of a century. Many who once thought otherwise are now clearly with him, and believe that *Substantialism* is the pivotal point on which must turn the final conflict in the life-and-death struggle of Christianity with materialistic infidelity. Hence the hearty support THE MICROCOSM is receiving, and is entitled to receive, in its conflict with false science.

In reinforcement of Prof. Kephart's estimate of the value of our recent demonstration by the newly-discovered method of measuring the prong's motion while sounding, we give the following letter from Capt. Carter, which speaks for itself:—
"Dear Doctor Hall:

"I have read your 'demonstration' in your reply to Prof. Stahr, and am delighted. Like all genuine discoveries of fundamental truth, it is as simple as it is forcible. I do not see how the most rabid wave-theorist will for a moment dare to dispute the fact so ingeniously and completely demonstrated. Of course, for myself, it was just as complete a refutation when you showed in the 'Problem' that the fork-prong only moved about sixteen inches a second; but a third of an inch an hour! Of course this serves better to expose the frightful absurdities of the wave-humbug.

A word with regard to the professors of science. No man among them has any stronger reason for adhering to the wave-theory than myself, having taught it for years; but I have long since adopted the principle of appropriating truth or excellence wherever I find it, *without once asking the name attached to it*. I also hold it to be a fundamental principle to be open to evidence, and not shirk conclusions because they seem to differ from previous beliefs. I have discovered from history that all knowledge, except that derived from revelation, is continually changing; and that the men

who discover any new thing are, and have been those who thought it possible that the world might be mistaken. He who imagines that any branch of science has become stereotyped had better read a little history. You have seen fit to speak very kindly of me in this matter. I deserve no praise for frankly admitting my convictions, but I do claim one virtue, viz.: to honestly consider, and candidly weigh, all the evidence obtainable upon a subject before pronouncing upon it; and, further, to be perfectly ready to change my views, if logically forced to do so. I have about concluded that the men who can deal with logic *in cold blood* are exceedingly scarce. Faithfully Yours,

R. KELSO CARTER."

"P. S.—Since writing the foregoing I have carefully examined your method of measurement of the fork's vibrations, and made repeated experiments with my large and superior fork of 256 vibrations to the second, and find your calculations to be most abundantly confirmed. While I congratulate you upon this final and overwhelming demonstration of the inherent absurdity of the wave-theory, I promise you a report of my experiments in a few days that will show that the facts of your demonstration (with a better fork) are at least *four hundred times stronger than you have made them*. R. K. C."

[The Report here promised by Capt. Carter will appear next month.—EDITOR.]

FOUR FORCES IN NATURE.

BY J. R. HOFFER, ESQ.

The real cause of infidelity among scientists and men of erudition is deep seated. It is the same that fascinates the woman at the presentation to her of the idea that "your eyes shall be opened, and ye shall be as gods, knowing good and evil," and caused her to regard the forbidden thing as "good for food, and that it was pleasant to the eyes, and a tree to be desired to make one wise." This is the opposite of that sweet, nestling, filial love which knows no higher joy than that which wells up from the heart in full recognition of the omnipotent, all-wise Source of all blessings, exclaiming "Abba, Father!"

But among the ostensible reasons given for the denial of God, or a Supreme Being, who makes and maintains the universe with all its laws, order, life and wonders, and for rejecting the Bible are that there is no evidence in nature of the tangible existence of such a Being, or of any supernatural power, and that the Bible is more like a book of fables and contradictions than living words of the all-wise God. It is claimed that all the operations in nature are rationally and scientifically traceable to matter; and that the claims in the Bible of a supernatural power are extravagant, unreasonable, and even unthinkable.

But that nothing satisfactory has yet been found to explain all the phenomena in nature upon scientific principles, is evident from the many new theories that are constantly being presented. Among the most remarkable of these is, the theory of George Whewell, F. I. C., F. C. S., concerning force. In a recent article to the *Journal of Science*, in which he refers to what he had before stated, saying, "In nature we recognized four forces, which we ventured to call atomic viva, organic viva, animal viva, and mensic viva (mind)." He adds "We assume that the elements contain

these four forces in a state of activity or otherwise, according to circumstances."

He then continues: "Take the life history of our theoretical molecules of carbon. Suppose that a molecule of carbonic acid gas floats about in the atmosphere, and is driven hither and thither at the caprice of every wind that blows. In this condition atomic viva is alone active, the other three being latent. In its passage over the earth it strikes against the leaves of an edible plant, the sun shines, and the molecule of carbonic acid gas is absorbed by one of the leaves of the plant, the carbon is retained, and the oxygen is given off again. The carbon becomes a portion of the substance of the plant. It has changed its condition from being a portion of a poisonous gas to be nutriment for man and animals. From being a portion of dead matter, it becomes a portion of living matter. The gardener takes the plant, cooks and eats it; by and by it is converted into blood, and is then in a condition to have its latent forces developed. It can become a portion of a muscle and possess atomic, organic and animal viva, and be a portion of a living body. It can become a portion of the brain, and produce thoughts—violent, demoniac, or sublime—at its own caprice. In this condition it possesses all the four forces in a state of activity. When it has produced these effects it again becomes carbonic acid gas, and finds its way into the outer world to be tossed hither and thither at the mercy of the winds. This same molecule of carbonic acid gas may go through this endless change from century to century. New forces must of necessity develop, and become latent in the molecule, in passing and repassing through this endless variety of changes."

This titled philosopher probably staggers with Ingersoll at the "mistakes of Moses." But perhaps the strongest grounds against the Bible, which to his mind cause its utter overthrow, are the miracles; the claims to a belief in the supernatural, or that which he regards as being in conflict with science and contrary to reason based upon what is found to exist in nature. The story of Moses before Pharaoh evidently appears to him almost ridiculously absurd. Shall a man so profound in science be asked to believe that when Moses threw his rod of wood to the ground it ran from him a living snake, which, when he took it by the tail, again became the original stick of wood? Or when he struck the ground with the same rod all the dust commenced to crawl, having become living lice? And could a man who nails down every argument he advances with solid facts, believe in the miraculous healing of the sick and lame, opening of the eyes and ears of the blind and deaf, and raising of the dead again to life.

Let us now look over his Q. E. D. of the four forces in nature, and consider the life history of our theoretical molecule of carbon as he gives it in the above quotation. It sounds like a fairy tale in the ears of almost any person but an infidel scientist. What was done with the rod of Moses is nothing in comparison with the transmutating and transfiguring powers of this molecule of carbonic acid gas, itself so insignificant that its confident defender might derisively say to those who would examine it, "Touch not, taste not, handle not." Yet no miracle recorded in the Bible is half as marvelous as this "life history" of a "molecule of carbonic acid gas."

Reasoning the matter between the rod of Moses and this molecule; if all elements in nature possess the four vivas named why should not Moses' rod bring the animal, and even the mensic, of the

Egyptian dust into activity, as easily as a molecule of gas can cause a man to think? Or why may not also all the gases and other elements in the body of a dead person again become "living matter" as before, if they still "contain these four forces?" Would this not be a result that should reasonably be expected? If they had been active before, must they now remain "otherwise?" And if an insignificant molecule of a dead gas can suddenly revive in a man's brain and there produce thought "at its own caprice," or in his muscles cause him to act, should it be deemed a marvelous thing for a living man in whose body are myriads of such molecules with their animal and mensic forces in full activity, to arouse the sleeping forces in the elements composing a stick of wood, the dust of the ground, a withered hand, or a dead human body? Can you imagine or think anything in the line of apparent impossibilities that should seem incredible to a person who can believe such a theory as that of Mr. Whewell? Does ancient or modern mythology, witchcraft or spiritualism, produce anything that looks as unreasonable as the latest theory of our age? And yet, it is copied into our most popular scientific journals; one of which even refused to publish an article adverse to it.

MOUNT JOY, Pa.,

CONDUCTION OF SOUND.

BY REV. T. NIELD.

It is strange that for so many centuries scientists should have misinterpreted the laws of sound with such persistent obtuseness. But it is inexcusable stupidity that has used the nomenclature of electricians without discovering the similarity existing between sound and electricity. Yet not one of the installed apostles of science has stumbled upon the idea that conduction implies other than the transmission of atmospheric motion, even through water, wood, iron, etc. It has been reserved for one outside the regular apostleship, to call the world's attention to what has been so long overlooked by the regulars.

Only a few of the infirmities of the wave-theory need here be pointed out.

None but a "scientist" could conceive of so delicate a piece of mechanism as that of a watch sending atmospheric condensations and rarefactions through a thick metallic case, its vibrating impulse causing such rapid beatings of the outside atmosphere by the agitated case, as to send off a new series of air-waves whose volume is able to fill all the space of a still room. Such, however, is required by the wave-theory. It would not help matters to speak of conduction. What is conducted?

A clock may be on one side a wall, and its tick be heard through the wall, filling the adjoining room. The wave-theory teaches, either that the clock propels air-waves through its case, and then through the wall, thus doing what a hurricane driving at the rate of sixty miles an hour cannot do; or else that the tick vibrates the clock case, and then the wall, with such power as to produce a second and a third series of condensations and rarefactions, that finally dash against the tympanum of the ear, making an in-and-out motion two hundred or more times a second.

It teaches, too, that, since the tick is in the same tone in the adjoining room, its vibrational number remains unchanged after passing through the

case, the paper on the wall, the mortar, the lath, and again through mortar, lath, and paper.

The greatest distance that cannon have been heard across the sea, is two hundred miles. But at the late bombardment of Alexandria, the sound passed along a wire under the sea, and was heard in the Island of Malta, five times that distance. If it seems incredible that air-waves should thus travel a thousand miles along a submerged coil, what shall be said of a sound that cannot be heard half a mile off in a city being heard by telephone from New York to Chicago? Oh, for the imagination of a Tyndall!

All the phenomena of sound point to conduction. A few may be mentioned.

1. *Insulation of sound.* The text-books teach that a bell placed inside a small receiver containing air, and this again inside another, from which the air is withdrawn, will produce no sound upon being struck, provided that "the bell be placed in such a manner that whatever supports it will rest on a soft cushion of wool, so as to prevent the vibrations from being communicated to the plate of the air pump, or any other of the solid parts of the apparatus." Thus we see that where both the bell and the atmosphere are insulated, no sound is heard, for want of a conductive medium.

The elevated railroad company of New York paid a good sum for the discovery how to deaden the sound of trains in motion. The discovery was, how to combine certain non-conductors so as most effectually to insulate the sound. And all improvements in this direction must be in the line of insulation which consists, *not* in muffling the atmosphere, but in neutralizing the conductivity of the material of which the road is built.

2. *Induction when in transit under electric impulse.* Induction is explained thus:

"A wire bearing an electric current seems to be for the time surrounded, to an undefined distance, by an electric atmosphere, and all wires coming within this atmosphere have a current in an opposite direction set up in them. Now, the telephone works with a very delicate magnetic current, and it is easily overpowered by the action of a stronger current in any wire near which the telephone wire may come. To work properly, it requires a silent line." Look at this phenomenon in the light of the wave-theory. A light puff of air is caught up by the electric current, which is estimated to travel at the rate of 288,000 miles a second. This atmospheric puff goes on, shivering with a tremulance of 200 beats a second, at over 200 times the normal velocity of sound, unbroken either by the surrounding atmosphere or the shock of its own velocity. And, as if this were not marvelous enough, it says that the current bearing this tremulant puff of air is met by a counter current which, instead of peacefully passing, trips it up and filches a portion at least of that timid air-puff bearing it off triumphantly in an opposite direction, still beating out its condensations and rarefactions! Such an exploit must make even a "scientist" stagger. It is something to be told at midnight to the ghost of Pythagoras!

Induction proves that electricity can concentrate and control sound, isolating it from the surrounding atmosphere, increasing and prolonging its velocity and transit, and reversing its course by counter currents. Here, we may possibly find a key with which to unlock the mystery—why an echo may be heard one day, and not on other days in the same locality. The atmosphere may be highly charged with electricity, when a reverse current attracts the sound and carries it by the law

of induction in an opposite direction. Perhaps it may aid in the solution of the problem given by J. H. Clark, as noticed in the MICROCOSM for April.

3. "*In general the intensity of sound increases with the density of the medium by which it is propagated.*"

Without atmosphere there is no sound. On the top of mountains, where the atmosphere is rare, sound is very faint.

Sound travels about four times quicker in water than in air, about ten times quicker in the fiber of pine wood, and seventeen times quicker in iron. Thus, we see that, as a rule, the ratio of increase in the density of the conductor is the increase of its conductive capacity. This is the opposite of all known phenomena of atmospheric motion. The denser the object in the path of a hurricane, the greater is its obstructive power. Shall we say that this law is reversed in respect to an air-pulse that is too feeble to be felt—that its vibrations pass through the obstruction with greater facility in proportion to the density of substance, even retaining the vibrations unbroken? Such an absurdity would long ago have been hooted into oblivion, had it not been for the mystery of scientific paradox thrown around it, like a nimbus, by the glitter of scientific names and the pretentious pomposity of dogmatic dullness.

Since objects that can thus resist the atmosphere when driving with the force of a hurricane, are conductors of sound, which increases its speed in passing through them, they have for it an attractive affinity akin to that of metals for electricity, exerting over it a similar power.

And now, what is sound-conduction? It is the transmissive activity of sonorous substances reciprocating by attraction, the emissive impulse that sets acousticity in motion. If we strike a bale of cotton, the energy of the blow is lost in the spring of the cotton. If we strike a ball of wood, it bounds away under the impetus of communicated energy, until the energy is counteracted by friction, or gravity, which amounts to the same; and it will travel faster and further as the facilities are increased for its expression of the initial energy. It is somewhat similar to this with sound.

Lacking a substantial medium with a sympathetic affinity to receive and express the energy in transmissive discharges of acousticity, the energy is lost, as in the blow upon the cotton bale.

Since acousticity is a substance, though never so imponderable, the gravity of the earth may have an affinity for it, whose retarding power is the equivalent of friction. Sound on the tops of high mountains, where the atmosphere has the minimum of substantiality, finds little receptive and expressive affinity in the atmosphere to assist it in resisting gravity. Hence its resistance is feeble, and sooner overcome by gravity. An increase in the affinity of a substance for acousticity is an increase in its transmissive capacity, as it is an increase in its power to resist gravity. Take the familiar fact that the sound of an approaching train is heard in the rails far in advance of sound in the atmosphere. The affinity of the iron for acousticity is greater than that of the atmosphere, which gives the rails a greater facilitating attraction, on account of which the sound-energy finds expression through the rails more readily than through the atmosphere, the rails at the same time more persistently resisting gravity. When, however, the initial energy is expended, conduction yields to gravity. Were it not for gravity, we see no reason why sound, once communicated to a cir-

cular rail, might not go on forever. Where the rails communicate no sound to the atmosphere, they are not charged with the emissive force that acts in vibration, hence, are incapable of emitting acousticity. In other words, the initial energy in transit is not sufficiently concentrated to generate emissive vibrations.

Electricity, next to gravity, has the strongest affinity for acousticity, and is capable of carrying this, its sister substance, in its invisible arms to amazing distances. The only reason we see why electricity is able to span the Atlantic, while unable to carry sounds so far, is the greater sensitiveness of acousticity to gravity. But our electricians will yet discover new means of power in the use of this subtle agent, and let us converse with the Eastern Continent ere many years elapse.

We have yet something to suggest on resonance.

EXPERIMENTAL PHYSIOLOGY.—NO. 1.

VIVISECTION—SCIENTIFIC CRUELTY.

BY R. P. LEWIS.

"I would not enter on my list of friends,
Though graced with polished manners and fine sense,
Yet wanting sensibility, the man
Who needlessly sets foot upon a worm."—COWPER.

The wealth of the English language is so great, and its adaptation to the expression of all the more delicate shades of thought and feeling so perfect, that no cause need suffer for lack of an able presentation. And yet this facility for marshalling ideas has its lower as well as higher use. The eternal principles of justice and mercy become twinkling stars when set in the clear sky of speech, luring our thoughts heavenward; yet no cause is so forbidding, but that it may be made to appear at least plausible by weaving about it a golden tapestry of words.

Still, this lower use of language has its value. Often we see vigorous intellect associated with weak conscience and a cruel cast of feelings, and but for this advocacy of vicious principles and the defense of unnatural practices to which this combination gives rise, the best minds would never be put on their mettle and the world would lack one of its greatest moral educators—the striking antithesis between right and wrong. Besides, the conscience of reformers, being educated in special directions, becomes very acute; and this is liable to make them impatient about results, and intolerant toward opponents. But here language steps in with its conservative plea, justifying some things and extenuating others; the people see that not all truth is on the side of the reformers, and the shifting centers of public opinion are regulated by a union of the coldest logic with the warmest sympathy. This union is the condition of lasting progress and the common soil out of which spring the most vigorous human virtues.

I have been led into this train of thought by reading two very able papers published in the *Contemporary Review*, for May, 1882: One by Vernon Lee, Esq., entitled "An Evolutionist to Evolutionists;" the other by Dr. Samuel Wilks, entitled "The Ethics of Vivisection." Mr. Lee writes for the laudable purpose of divesting the controversy between the physiologists and their humane critics of some of its partisan bitterness, and, if possible, "to avert from the lamentable final alternative of gradual disgusted alienation from scientific belief, or of self-complacent sophistication of moral judgment, the degrading muti-

lation of reason or of conscience." He opposes vivisection on grounds of natural justice; and while conceding that the experimentalists are the most competent judges of its value to medical science, he couples a delicate compliment with a most cutting criticism and a powerful appeal to conscience when he suggests that "men whose noted consciousness and wisdom give them the terrible responsibility of being moral authorities, may yet be dragged by the irresistible power of their professional curiosity and reputation; or may insensibly drift by natural dislike to struggle and isolation, into committing, or even less excusably, defending evil."

Dr. Wilks, on the other hand, assumes that the question of experimenting upon live animals, is fundamentally a physiological one with which science has little or nothing to do. This position I wish to combat; not so much because it is directed against a measure that has been pending in Parliament for several years providing for the total abolition of vivisection, as, because it is essentially vicious and strikes at the common basis of morality and religion the world over—natural sense of right and wrong. If the protection of law should be extended to animals from motives of kindness to them, the humane tendencies of our time will make that fact apparent; if not, the present controversy offers a fitting opportunity to quiet the public conscience in that regard, so that no further annoyance need be given by attempts, to legislate in their behalf.

Before presenting the moral considerations which in my judgment ought to govern our relations to the brute world, let us glance at the facts brought to public notice by this painful controversy about vivisection; and it may be stated in this connection, that the movement against scientific torture originated with the society for the prevention of cruelty to animals, and that the first organization of that kind was formed about sixty years ago in London, England. Now it is a numerous and wealthy body, embracing among its patrons the Queen, the Baroness Burdett-Coutts, the Earl of Harrowby, W. E. Gladstone, and many other names known to royalty; besides having the direct support of hundreds of the English clergy and many of the most trenchant writers, with kindred societies in Asia, Africa, Australia, the United States and Canada. The movement is spreading rapidly in this country, both press and pulpit being permeated largely by its unselfish spirit.

On the occasion of the assemblage in London, in 1874, of delegates from foreign countries connected with the association for the prevention of cruelty to animals, the Queen expressed a warm interest in the success of their efforts, horror in hearing and reading of the sufferings which the brute creation often undergo, a fear that much cruelty is inflicted in the pursuit of science, and a hope that the entire advantage of those anæsthetic discoveries from which man has derived so much benefit in the alleviation of suffering, might be fully extended to the lower animals. This led to the appointment of the Royal Commission of 1875, "to inquire into the practice of subjecting live animals to experiments for scientific purposes, and to consider and report what measures, if any, it may be desirable to take in respect of any such practice." The report of this commission, with the minutes of evidence, given by more than thirty medical and scientific men, including Charles Darwin, George Henry Lewes, and W. B. Carpenter, constitute what is known as the "blue book" of Parliament for 1876. Since then, some of

these gentlemen, and others of the experimental school of science, have appeared in the leading prints of Europe and America in defense of the practice of vivisection, and laid particular stress on the fact that this report of the royal commission exonerates the English physiologists from the charge of cruelty. Having read the report and the evidence, I am prepared to say just what the investigation did show. It established, first, that the majority of English physiologists are not to be charged with wanton or purposeless cruelty; but, second, that their experiments are conducted with little, if any, regard to the sufferings of their victims. Of course, when acting on the defensive, knowing that the investigation was designed to form a basis for restrictive legislation, and feeling (as one of their number expressed it) that they were being treated "as a dangerous class, to be licensed and regulated like publicans and prostitutes," they would be very guarded in their answers. Still, they said enough to confirm the worst fears of the humane public. Take, for instance, the testimony of Dr. Kline. I quote from the blue book:

3528. Are you assistant professor at the laboratory of the Brown Institution? Yes.

3529. Do you hold any other public appointment? I am lecturer on histology at the Medical School of St. Bartholomew's Hospital.

3530. Are you the author of the first section of this book, which is known as a hand-book for the physiological laboratory? Yes.

3538. What is your practice with regard to the use of anæsthetics in experiments that are otherwise painful? Except for teaching purposes, for demonstration, I never use anæsthetics where it is not necessary for convenience. If I demonstrate, I use anæsthetics. If I do experiments for my inquiries in pathological research, except for convenience sake—as for instance on dogs and cats—I do not use them. On frogs and the lower animals I never use them.

3539. When you say that you only use them for convenience sake, do you mean that you have no regard at all for the sufferings of the animals? No regard at all.

3540. You are prepared to establish that as a principle which you approve? I think that with regard to an experiment, a man who conducts special research, and performs an experiment, he has no time, so to speak, for thinking what will the animal feel or suffer. His only purpose is to perform the experiment, to learn as much from it as possible, and to do it as quickly as possible.

3541. Then for your own purposes you disregard entirely the question of the suffering of the animal in performing a painful experiment? I do.

3542. Why do you regard it, then, when it is for a demonstration? Because I know there is a great deal of feeling against it in this country; and when it is not necessary, one should not perhaps act against the opinion or the belief of certain individuals in the auditorium. One must take regard of the feelings and opinions of those people before whom one does the experiment.

3543. Then am I wrong in attributing to you that you separate yourself entirely from the feeling which you observe to prevail in this country in regard to humanity to animals? I separate myself as an investigator from myself as a teacher.

3544. But in regard to your proceedings as an investigator, you are prepared to acknowledge that you hold as entirely indifferent the sufferings of the animal which is subjected to your investigation? Yes.

3546. Do you believe that that is a general practice on the Continent, to disregard altogether the feelings of the animals? I believe so.

3558. But you believe that, generally speaking, there is a very different feeling in England? Not amongst the physiologists: I do not think there is.

This statement of Dr. Kline puts the English physiologist on the same plane of atrocious cruelty, so far as they are not restrained by law and public sentiment, with Claude Bernard and the infamous Majendie. That he did not misrepresent them is shown by the fact that he has not only been associated with Dr. Brunton and Dr. Michael Foster in the preparation of the handbook of the physiological laboratory, but has been entrusted by Mr. Simon (medical officer to the Privy Council, who has the expenditure of the annual grant of two thousand pounds for scientific purposes) with making certain pathological investigations on animals. It is still further evident from the fact that the other doctors examined before the commission made no protest against Dr. Klein's statement, and one of their number (Mr. Simon) says that he had no reason to think that he was not a very kind man(!). This testimony also throws a painful light on the remarks of Dr. Sanderson, that he "wished to see the type of education here (in England) more like the type of Education in Germany (2732); and on Dr. Gamgee's eulogium of Prof. Ludwig, of Leipsic, who, he is certain, "is as cautious in the performance of any experiment on a living animal as any English Physiologist that ever lived, and who has been the teacher of all the physiologists of Europe, and has indoctrinated nearly the whole of them in the methods of physiological inquiry!"

We shall presently see what is the type of education in Germany and elsewhere on the Continent, which Dr. Sanderson would like to have more common in England. And in passing permit me to quote a remark from Miss Frances Power Cobbe, who has given this ghastly subject an exhaustive consideration:—"I am compelled to testify that, in wading through a mass of this dead-sea literature, I have never been refreshed by a single passing expression of commiseration for the animals, whose signs of agony are recorded merely as interesting features of the experiments; or of regret that the higher scientific objects in view necessitated the prolongation of their tortures. If such feelings exist in the hearts of the operators, I congratulate them on the signal success wherewith they eliminate the slightest trace of them from all their reports. Further, in perusing the reports dedicated to the instruction of young students, I have looked equally in vain for any hint of caution, or recommendation to parsimony, in the use of the most excruciating experiments."

A few samples of these experiments are here given from a record of hundreds. Claude Bernard records this one as having been made in his laboratory in the College of France:

"We cut out the kidneys from a bull-dog [A pretty statement to begin with!] Next day, twenty-four hours after the operation, the dog, without being enfeebled, appeared dejected, respiration was impeded, and sighing. He had vomited during the night. He refused all food and avoided movement, appeared to suffer, and at times cried out. In order that his cries should not disturb the neighbors, we applied a muzzle pretty tightly. When during the day we returned we found the dog lying dead, his muzzle bathed in a fetid fluid, which he had vomited. The muzzle had hindered the expulsion of the vomiting, and caused the animal to be suffocated by it."

In Bernard's posthumous work on "Operative Physiology," he describes at length the experiment known as "catheterism of the blood vessels." The object of this is to obtain blood from the different parts of the heart and from the deeper seated vessels for analysis. The animal is muzzled, bound down, and the jugular vein dissected out and opened into, and through this opening a bent tube or catheter is inserted and pushed down through the heart into the great vein which brings the blood from the liver and hinder parts of the body. One of the last acts of this "father of modern physiology" was the invention of a more convenient stove for baking animals alive, in order to study the mechanism of death by heat. In none of these cases are anesthetics used, as they would defeat the object of the experiment.

This is the man to whom the physiologists of Europe have raised a statue.

Majendie, the celebrated Parisian professor, nailed a fine sensitive little spaniel, which he had bought at an auction, by its four paws and its long silky ears, to a table (before anesthetics were invented), that he might show his pupils more conveniently and uninterruptedly the separating of the nerves of the eyes, the sawing of the skull, the cutting of the spine, and the laying open of the different sets of nerves. Then he kept the poor animal, still alive, for the experiments of the next day. The same man cut the stomach out of a dog and fastened a pig's bladder in its place, and then observed the interesting physiological incidences of the slowly expiring animal. And yet Professor Carpenter speaks lovingly of Majendie in a late number of the *Fortnightly Review*! It is easy enough now to see why the Professor gave himself away when testifying before the commission. When his attention was called to an experiment mentioned in one of his own works—pouring boiling water into the stomach of a live dog—he declined to give any opinion as to its cruelty, on the ground that it had only been inserted in a late edition not compiled under his superintendence. Afterwards he was referred to an earlier edition of his work, compiled by himself without assistance, where the experiment was described word for word as in the question, and his explanation was that he had forgotten it.

Here is a specimen of the type of education in Germany, taken from the work of Prof. Goltz, of the Physiological Institution at Strasburg: "A very clever, lively young female dog, which had learned to shake hands with both fore paws, had the left side of the brain washed out through two holes on the 1st of December, 1875. This caused lameness in the right paw. On being asked for the left, the dog immediately lays it in my hand. I now demand the right, but the creature only looks at me sorrowfully; for it cannot move it. On my continuing to press for it, the dog crosses the left paw over and offers it to me on the right side, as if to make amends for not being able to give the right."

Please notice the coolness and evident pleasure with which the Professor thus treated his pet companion. He probably believed, with Dr. Wilks, that ethics has nothing to do with the treatment of brutes. For one, when it comes to the question of morals here or happiness hereafter, I would much rather be the dog than the professor.

Any student of science desiring this volume of THE MICROCOSM from the commencement, (August number), can send \$1. to Hall & Co., 23 Park Row, New York.

THE MODERN THEORY OF FORCE vs. MATERIALISM.—No. 1.

BY REV. JOS. S. VAN DYKE, A. M.

Advanced science quite generally entertains the following opinions in reference to force:—

I. As to its origin—it is spiritual.

II. As to its nature—it is immaterial, indestructible, convertible, can not be evolved from matter unless it has been previously involved in matter.

I. Force is spiritual in its origin.

Science, acting in its own legitimate sphere, is aiding theology in an almost unprecedented manner. It claims to have proved that the several physical forces—light, heat, electricity, magnetism and chemical affinity—are merely different modes of one and the same force. It is thus giving us pleasing glimpses of the reasonableness of belief in a First Cause of all things. It is rapidly accumulating testimony in favor of the theory that force is the immanence of the Divine will in Nature, the omnipresent energy of a personal God. It is assisting reason in her effort to regard Natural Law as the ordinary method in which God chooses to operate in Nature, as in fact the Supernatural operating with such unvarying uniformity, as to create the impression that physical laws are independent of Divine volition. The Natural may thus be regarded as the Supernatural rendered familiar; the Supernatural, as the Natural striking us with surprise, because of the infrequency of the opportunities of observing it.

That force originates in spirit, not in matter, is the theory of Lotze, of Grove, of Carpenter, of Herschel, of Beale, of Joule, of Leibig, of Faraday, of Mayer, etc.

If we do not regard force as having its origin in the Deity, how shall we account for it? Is some coming Haeckel, or some inspired Darwin to construct a theory in reference to the evolution of force? Are we to be told that as the entire animal kingdom is an evolution from lifeless matter through an atom of plasson, so forces have been evolved from persisting forces, backward to an atom of force? Are we to be startled with the announcement, "The universe has been evolved from two 'homogeneous atoms,'—one of plasson, one of force? These, lying in eternity, side by side, on the ocean of immensity, possessed the potentialities of a limitless unfolding: the hypothesis of a God is unnecessary."

Alas, the fruitlessness of human effort! When, through herculean labors, the theory has been successfully launched upon the troubled sea of speculation—the two imaginary atoms being ready to begin business—an infant can demolish the colossal hypothesis by simply asking, "Pa, who put so much into these two little atoms? Did God?"

"My child, you have never studied science. Go play; and let the immaterial sun-light plant roses on your cheeks."

(To be Continued.)

THE METRIC SYSTEM.—Next month we will print a reply to Prof. Wilhelm's article in the September MICROCOSM, from the pen of Prof. Graham so sharply criticised by Prof. W. We have begun to realize that one side of this discussion is good till the other side is presented. Really there are two sides to this question, as much so as we have ever witnessed in any discussion. Readers competent to appreciate the Metric Controversy will be deeply interested in Prof. Graham's reply.

OUR MEDICAL CONTROVERSY.

NOTE.—A writer in Feb. number of THE MICROCOSM, Elder J. G. Burroughs, used the law *similia* as an illustration in an article on *Redemption*. In the April number Dr. Stuart says, this was "in very poor taste," as so many regulars read THE MICROCOSM. I replied in the June number that even so-called regulars were using the remedies of homœopathy, while homœopaths only claimed to administer remedies according to the well-known law of cure of Hahnemann. And now in August Dr. Cronin gives *his views* on homœopathy, to which this is a reply. A. P. BOWIE.

HAHNEMANN, THE FOUNDER OF HOMŒOPATHY.

BY A. P. BOWIE, M.D.

Editor of THE MICROCOSM:

In the August number of your valued magazine, we are criticized for claiming that "Hahnemann was the discoverer of the true law of Therapeutics." Now it is well known to "scholars" that all great truths have generally been foreshadowed by more or less obscure hints and beliefs—or presentiments, as it were, until *the man* would arise who would give the discovery to the world, freed from error and strange hypotheses.

Many anatomists before Harvey's time had notions about the circulation of the blood, and years before James Watt produced his steam-engine the application of steam had been proposed and carried out. Also Jenner's discovery was known before he announced his discovery, and yet who will undertake to rob these men of the honor which is their due? And if the discovery of Hahnemann was foreshadowed by Hippocrates and Paracelsus (whose proper name was Theophrastus Voh Hohenheim) it does not in the least detract from his title as the founder of the true law of Therapeutics. *For no physician before Hahnemann's time claimed the law "similia similibus curantur" to be a universal law of cure in all curable diseases, and founded a system of medicine upon it, and called it homœopathy.*

The homœopathy of Hahnemann has nothing to do with the crudities of Hippocrates and Hohenheim; for hitherto none taught this homœopathic method of cure, no one put in it practice. But if the truth is contained alone in this process as others will observe, says Hahnemann, then we must expect to discover its actual *traces* in all past ages.

Although it was not acknowledged for thousands of years, Hahnemann tells us how he made the discovery. It was while translating Cullen's *Materia Medica*. He was not satisfied with the explanation of the action of *cinchona bark* in that work, and he took a portion of the medicine and found it produced on his healthy body *symptoms* similar to the disease for which it is a specific; and the truth dawned upon his mind that it was able to cure intermittent fever, on account of its producing symptoms in the healthy similar to the disease. And, by further experiment, he found this was true of other drugs as well; and then after making the discovery, and when convinced of its truth, he announced it to the world—and then commenced the great medical reformation which HAHNEMANN entitled homœopathy, and which placed the practice of medicine on a scientific basis.

It is true that Hahnemann and all his followers have been ridiculed and abused and misrepresented to this day, but it has lived through it all; and more than ten thousand physicians, with millions of patients, are its adherents to-day—not counting those who use homœopathy on the sly. And now at this late day some of the liberal minded Allo-

paths, seeing the progress we are making, are willing to consult with us—even before we asked them.

What a change!

But as homœopathy has arrived at strong and vigorous manhood, and is making giant strides everywhere with Colleges, Hospitals and Dispensaries, I think its "permanency" is pretty well assured.

For if it was not killed in infancy, it was not the fault of the so-called-regular-we-are-the-people-doctors; for they administered their heroic remedies, but somehow they would not act. The only "crucial test" homœopaths ask is, a trial on the sick.

Now if some physicians practise what is termed the "mixed system," no one in his senses would call that homœopathy; but Eclecticism would be a better term. "Homœopathy pure and simple" constitutes the true homœopath, with all the aids Chemistry, Hygiene and Surgery can add. There are some measures physicians of all schools practice, and the homœopath uses them when necessary. Homœopathic physicians are not the fools some would try to make the people believe, but they use the best means to restore the sick—they *care* more to *cure* than to *theorize about the disease*. All physicians of the New School are "anxious to perfect themselves" in scientific medicine and surgery, and their adoption of the true law of Therapeutics is proof. "Theoretic medicine" belongs to the Old School; they want no law or "exclusive dogma," as they term it, but a new theory they must have; and just now the "Germ theory" is fashionable, although the germs are so *small* it takes a microscope to reveal them—and yet what wonderful effects are ascribed to them! But such discoveries have no more to do with homœopathy than the "mixed system," for the remedies for all the diseases ascribed to them are treated by homœopathic remedies; and a noted homœopath has demonstrated that the so-called Bacteria are formed from fibrin charged by disease. The terms I used in regard to using the remedies discovered by homœopaths and palmed off on students without giving credit to the new school, may seem harsh; but an English homœopath of note, and lecturer of the London School of Homœopathy, says, "Throughout the profession—may God forgive them—the great name of Hahnemann is shamelessly maligned, while at the same time his life's labor is being appropriated by the pilfering professors of our schools."

Now we are perfectly satisfied for the regulars to learn that "the use of small and frequently repeated doses of medicine" will cure, and are not near so hard to take as the polypharmic doses of old, but say the indications for their use were gotten from the homœopathic *materia medica*. We claim *no* patent right on our remedies, but ask for credit where credit is due. But we are told from "Nature's laboratory" remedies are derived. May I not ask—was not Hahnemann a devout student of Nature? Those who are acquainted with his writings, know he was. Hear what he says:—"As the wise and beneficent Creator has permitted those innumerable states of the human body differing from health which we term disease, he must at the same time have revealed to us a *distinct mode* whereby we may obtain a knowledge of disease, that shall suffice to enable us to employ the remedies capable of subduing them. He must have shown to us an equally distinct mode whereby we may discover in medicine those properties that render them suitable for the cure of diseases,

if He did not mean to leave His children helpless, or to require of them what was beyond their power. This act so indispensable to suffering humanity, cannot therefore remain concealed in the unfathomable depths of obscure speculation, or be diffused through the boundless void of conjecture; it must be accessible to us—*readily accessible* within the sphere of vision of our external and internal perceptive faculties." Hahnemann believed in the illimitable possibilities of medicine, because he believed in God. And in this age of skepticism and doubt, it is refreshing to read and learn from such an one—for surely there are some fixed facts—and the therapeutic law *similia similibus curantur* is one of them.

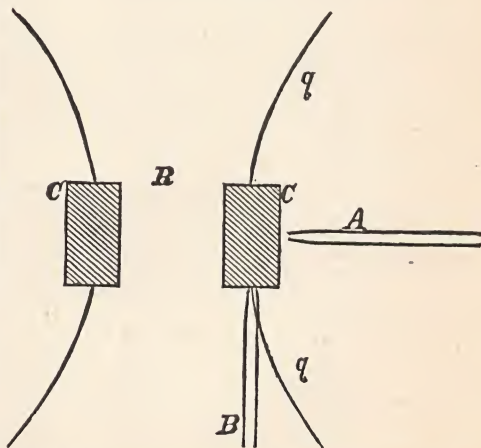
This law is the corner-stone which all other builders of medicine rejected; and it has found a tried and true rock against which all the storms of allopathy have dashed in vain, and it lives to-day to assert its claim as the true Healing Art. To thoroughly appreciate the great mass of Hahnemann's discovery, one should be acquainted with the practice in vogue of that day—when the most heroic remedies were employed and harsh measures were the rule and not the exception.

He lived in a time when heroic anti-phlogisticism was in full force; when physicians "slowly," as in Addison's day—"some in chariots and some on foot," when every sufferer from acute disease was drained of his life blood, poisoned with mercurials, burned with antimonials, and raked with purgatives. He denounced all this as irrational, as needless, injurious; and it has fallen—never, we trust, to resume its sway.

UNIONTOWN, PA.

THE WAVE-THEORY'S BEST EXPERIMENTS.—A DISCOVERY IN SOUND.

BY CAPT. R. KELSO CARTER.



(In this cut the tube B, should be a little to the right of the centre of the prong C, which it is not—by mistake of the engraver.)

When Dr. Hall wrote his explanation of the famous double siren he builded much better than he knew. The fact is that the explanation, recorded on pages 288, 297 of the *Problem of Human Life*, gives the key that will unlock every phase of the subject of Interference. We showed, in our last

article, that the common-sense explanation of the tuning-fork held corner-wise completely upsets any theory of interference; but we have reserved for this article a unique discovery, made by Dr. Hall and myself, while experimenting with a large fork. A small diagram will be necessary.

Any one can verify in a moment the statement that the volume of sound from the face of the fork is very much stronger than from the side or edge. According to the theory, developed in our last article, the sound is conducted from the fork chiefly in the direction of the vibrations, or to the right, and left in the diagram. In the cross direction there is an extremely feeble sound. Dr. Hall had suggested using a fine tube, through which to listen, in order to ascertain beyond doubt, how much sound issued from each face of the fork. This tube, made of glass drawn to a small aperture, was attached to a rubber hose, one end of which was inserted in the ear. The tube was then applied to the fork in every conceivable position, and the results carefully noted. Of course it will be understood that the tube was held so close to the fork that the latter prevented any appreciable amount of sound from entering the tube from any other source than the face experimented upon. In this way we thoroughly tested every face. When held as at A the sound was loud and full; at R it was also loud, provided the tube nearly or quite entered the space between the prongs. At B, however, there was a very feeble sound. *In listening to this our discovery was made.* By our theory of conduction, first given to the world in the October MICROCOSM, there should have been no sound at this point; yet, there it was. If we were wave-theorists, we would have had no difficulty whatever, in proclaiming that the desired silence had been obtained; but having our eyes opened to the frightful inconsistencies of that theory, we could not help hearing a sound. Now, what was that sound? It occurred to the writer that, the sound heard at this point was not a *direct* sound, but one heard by conduction *through the steel, and then through the air.* In other words, the mass of the sound being conducted by the air, from the faces C; it would then appear that the sound, heard through the tube at the edge B, was really that generated at the faces, conducted through the steel of the fork to the air, and thence, by the tube, to the ear. The change of conducting medium, viz.: from steel to air, would account for the feebleness of the sound.

At this point in our reasoning the great discovery was made. We observed that this feeble sound, heard at the edge C, *was the octave of the fundamental made by the fork.* Almost immediately the Siren explanation recurred to mind; here was a new lead to be worked by its aid. But first we tested it exhaustively. We had a large fork specially constructed, giving the C of 128 *cs.*, and having its prongs nearly two inches apart; and also a straight steel bar. *With each of these we obtained the same results.* We held the small tube to the faces and edges of each, and were rewarded by results as consistent as they were fatal to the wave-theory. Now, be it most especially noted that the *flat bar*, held in the centre and caused to vibrate, gives a strong sound from the face, a weak one from the edge, and the silence (?) of the wave-theorist forms the line *q*, *near the fork*, just as the regular fork produced. We wish every man who still adheres to the wave-theory would carefully consider the terribly fatal nature of this one fact. Even a fool can not claim interference between the two ends of a straight bar,

yet we have precisely the same phenomena manifested in both the bar and fork. Will Professors Tyndall and Mayer please make a note of this? We reasoned that this octave resulted from a combination of the single vibrations, coming from the two faces of the same prong, thus producing the octave in the same manner as the double Siren; and that, therefore, the same octave ought to be heard at the top of the fork. Upon trying this place, that is, the flat top of one prong, we could distinctly hear the same feeble octave. *Make another note of this.* Where could there be any interference in such a case?

But we think we hear some wave-theorist chuckling over a deadly oversight on our part. He will say: How is it that you do not hear this newly-discovered octave through the air? for it is plain that the whole number of vibrations, say 512 singles from the C³ fork, reach the ear anyhow through the air? How then can you get a difference by listening to the same 512, conducted by steel and air, as you claim? We confess that we would have experienced great difficulty in answering this, if it had not been for the aid unconsciously furnished by Prof. Tyndall. Just here we have recently made *another discovery absolutely new to the science of acoustics.* But this discovery we will hold back until another issue. Meanwhile, we cordially invite any skeptic to consider the apparently absurd position into which we have walked with our eyes wide open. It is this. We assert that the 512 single vibrations, which are heard by the ear through the air, give the note called C³, as admitted by all; but when heard by conduction through the steel of the *sounding body*, and afterwards through the air, they give the octave, or the sound due to 1024 single vibrations as heard ordinarily through air alone. And the proposition is, that we will sustain this apparently suicidal position from Tyndall's lectures on Sound. Truly there are strange things in nature.

In the light of this octave discovery we obtain an additional reason for the so-called silence of the fork, held over a resonant jar; for if the weak octave is issuing along the line *q*, it is plain that this octave could not cause the air in the jar to resound, for the jar is a little more than twice as deep as the octave requires. But besides this fatal objection, the octave is so weak that it will not cause resonance in a jar, even if it be of the correct depth. We have taken the pains to try this. By using a small funnel, instead of the little glass tube, as above, we were able faintly to distinguish our octave along the line *q*. This faint octave is the silence of the wave theory. Truly the double Siren is useful. Now let us sum up the facts.

1. The sound from the face of the fork is strong and full.
2. The sound from the edge is weak.
3. This sound from the edge is a very feeble fundamental, except near the middle of the edge where it distinctly becomes the octave.
4. This octave is also heard at the top of the fork.
5. Both at the edge and top this octave is at a point a little outside the centre line.

The explanation we offer for the existence of this octave at the edge and top is that the leftward vibration of the prong, is combined with the right vibration (which of course occurs in alternation with it), and in this way double the number of vibrations are united and we have the octave. This octave, being formed within the metal of the fork, is first conducted by the steel to its outer surface, where it passes into the air, thus changing media,

and is conducted by the air to the ear. The explanation of its weakness is found first in the fundamental proposition, already laid down, that sound is not conducted by the air with any facility in any direction other than that of the vibrations of the sounding body; and second in the fact that the octave heard is conducted by two distinct media, losing heavily in volume in the transfer. Let it be clearly understood that we only claim the first reason, viz., that the sound is best conducted in the direction of the vibration, *for limited distances*. We may be prepared to take the ground that this rule will hold true for any sound which is produced by a body that *vibrates only in one plane*, as is the case with a fork. Manifestly a bell, which vibrates in all directions, could not be treated in this way; but of course there never were any silence corners discovered about a bell by the most ardent advocate of the wave-theory. Now we submit that, if there is any truth in interference, we should find one half a bell interfering with the other half and producing silence along some line; who will be the first to find it? Lastly, we explain the existence of this newly-discovered octave, on the outer side of the centre line of the edge and top of the prong, by the fact that the inner vibration, or rather that from the inner face is reinforced by the vibrations from the inner face of the other prong, which travel across the small space between the prongs, enter the first by change of media, and being seriously weakened by this change, only succeed in slightly overbalancing the outer vibration, the effect being to throw the resulting octave a little outside the centre line, as shown by the direction of the tube B. This explanation is about demonstrated by the fact that, when the straight bar is used, the octave is heard *just at the centre*. This fact alone would about balance the apparent contradiction in the number of vibrations, but we have a clear discovery to meet that point and to remove all difficulty. We have given so many hints of the nature of this discovery that we would fear some one might anticipate us, but for the fact that its very nature is so far removed from any and every principle of the wave-theory, as to render such an accident exceedingly unlikely. Meanwhile ponder upon the above facts and theories.

PA MILL-ACADEMY.

THE MERCERSBURG PHILOSOPHY.—No. 1.

BY REV. J. I. SWANDER, A. M.

It may appear like presumption on the part of the writer to attempt a pen-portraiture of a philosophic system whose profound questions have enlisted the serious attention of the world's most noble intellects; and whose beauty is unsurpassed in its powers of fascination over the lovers of organic truth. Should the present effort be judged, by any one, in such unfavorable light, it is hoped that the critic will bear in mind that it is our intention to give only our individual apprehension of a system which we have studied for a quarter of a century with all the fervor of enraptured earnestness. Besides, it should be remembered that the space allowed is too limited to permit us to touch at more than a few points in the field before us. It should also be stated in advance that the task of correctly characterizing this School of Philosophy is somewhat peculiar and difficult, since its order of thinking is not on a line precise-

ly parallel with the inductive activities of the Anglo-American mind.

It is now nearly a half-century since the little village of Mercersburg, Pa., became the local centre of a remarkable movement in vigorous thought. This movement awakened the attention of unprejudiced intelligence throughout the world, and gave the place a historic significance for all time to come. Neither has it proven a plant of ephemeral growth. That which germinated in hope is unfolding its powers with a promise of permanent existence. The position taken by the leaders is maintained, by their followers, with a confidence inspired by a growing consciousness of its strength. While it numbers its friends by thousands, it molds the thinking of thousands more who once tried to hoot it out of existence. Indeed there are many who are pointing with the prophecy of enthusiasm to Mercersburg Philosophy as "not the least among the princes," believing that out of this enshrinement of organic and progressive thought shall ultimately appear the rising, reigning truth "whose goings forth have been from of old, from everlasting."

Mercersburg Philosophy does not follow any one man; neither is it an imitation of any previously defined system. It is rather a reproduction of the best principles of the later German Philosophy as advocated by Kant, Schelling, Hegel and Schleiermacher. None of these, however, have been followed with blind devotion. On account of the prevailing rationalism of their age, their teachings have been received with charitable caution, and sifted with that scholarly independence which resulted in the elimination of much error, as well as the extraction of much truth. Perhaps Schleiermacher did more, directly, than any other man in advancing the fundamental principles which lie at the foundation of this modern school. This he did rather in the character of a theologian. As such he stamped his own age with an impress that will continue to imprint itself upon all the ages to come. The piety of his heart, the energy of his will, the grasping power of his intellect, as well as his marked individuality contributed toward making him a master in the domain of bold and aggressive thought. Whatever of heresy his early writings may have contained in the way of pantheistic leanings and empirical tendencies, his teachings still contained seed-truth enough to plant a continent, and a sufficiency of fructifying force to produce an abundant harvest in the whitening fields of Christian science.

At the time of Schleiermacher's death, in 1834, Frederick Augustus Rouch was twenty-eight years old. He was a young German philosopher of great natural ability and fine intellectual attainments—a Christian in head and heart, in profession and practice. He was a graduate of Marburg University, and subsequently became a professor of philosophy in the celebrated University of Heidelberg. Living in the same country and age with great men who dared to follow the leadings of great thoughts, he was well prepared to cross the Atlantic with a blessing for the Western world. In 1835, Providence led him to Mercersburg, Pa., where he was installed as the first President of Marshall College (now Franklin and Marshall College, Lancaster, Pa.). Here he began to sow the seeds of German thought in English soil. His treatise on Anthropology, and his profound work on Psychology, opened the door for an order of thinking, which, for philosophic beauty and fragrance amidst the travesties of much modern teaching, has justly been compared to a blooming

rose in the charnel-house of mechanical abstractions.

Dr. Rouch departed this life in 1841, at the age of thirty-five years, leaving behind him the nucleus of a system whose immortality will outlive the stars, and whose glory is destined to outshine the sun. Soon after his death, a committee was sent to Germany to secure some one competent to fill his place. Upon the recommendation of the learned and pious Dr. Frederick Krummacker, the Rev. Philip Schaff, of Berlin, Prussia, was called in 1844 to Mercersburg and placed in the Chair of Church History and Exegetic Theology. Dr. Schaff need not now be introduced to an intelligent audience since he has proven himself a prodigy of learning, as well as a Christian minister of world wide reputation. His *Principles of Protestantism* in 1845, caused much of the theology of this country to roar with pietistic rage. While he was an avowed admirer of Schleiermacher, he knew how to seize the truth, and filter its waters from the feculents of that ruinous rationalism which infected the most masterly productions of the Hegelian age.

But the man most generally regarded as the foster-father of Mercersburg Philosophy is the Rev. J. Williamson Nevin, D.D. LL.D., first successor to the lamented Rouch in the presidency of Marshall College. He was born under the planet of Puritanism, and rocked in the cradle of its peculiar piety. When called to the tendered position at Mercersburg, in 1840, he was ready to follow the leadings of an obvious Providence. In the budding out of a most remarkable manhood he entered the new sphere of his labor, identified himself with the Mercersburg movement in its incipient stage, and has since performed the most important part in the development of its fundamental principles. He inculcated its truths in the lecture room, discussed its merits in his voluminous writings, and permitted its appearance in the background of all his pulpit portraiture. Dr. Nevin has shown that the modern method of interpreting the Scriptures is according to an arbitrary rule of exegesis, and after an iceberg order of orthodoxy. He has made it appear that much of our popular theology is both unscriptural and unphilosophical, and many of the reigning religious notions of the nineteenth century after an order very different from the Primitive and Cyprianic type. His powerful pen has reached across the Atlantic in profound discussion with some of the acknowledged theological giants of Europe. Having a love for the true principles of Protestantism, and an abiding confidence in the legitimacy of its claims, he has bearded some of the ablest Roman Catholic controversialists in their den. His organic method of reasoning led him to dispute with those Protestant theologians who deny the most vital and proper principles of Calvinism, while they display the metaphysical skeleton of the great Genevan reformer. His *Anxious Bench* rebuked the presumptions of fanaticism as it began to introduce its programme of religious excitement about forty years ago. During those forty years he has led his disciples through the wilderness toward the promised land. He is now nearing the Mount Nebo of his pilgrimage. Having passed, by reason of strength, his four score years, he is not far from that "better country" where the Christian philosopher's dreams are realized in the rapturous visions of triumphant truth, and the rich possessions of imperishable glory.

Mercersburg Philosophy starts in a moderate Realism, and moves forward under the most

reasonable assumption that this terrestrial universe, including the "invisible things of God from the creation of the world," as well "as the things which do appear," is bound together by an inward principle of unity, thus constituting it an organic whole. The *wholeness* of God's creation is emphasized, rather than the *altness* thereof. Sand-heap philosophy is looked upon as pitiable nonsense. God's great thought, taking form in the world's being, is not a mere Omnipotent Abstraction, but the veritable substance of a common thread upon which all essential parts are strung. Only as thus strung,

"In reason's ear they all rejoice
And utter forth a glorious voice."

While there are many keys to the instrument, many tones in the melody, and many parts in the grand orchestral chant, every rational touch of a key brings up, in deep-toned diapason, the musical utterance of an organic truth:—All for each, and each for all; and all for Him who is over all, God, blessed for evermore.

The finite scope and measure of the world culminates in man: Not, however, in the way of an evolution according to materialistic Genesis, but in the responsive actualization of a Divine purpose or plan which came down from God out of heaven in order that it might reach up to God again from the lowest form of the inanimate, through the ascending series of such an organic whole. Each lower stage foreshadows the coming of the next higher—preparatory without being parental—according to the Mosaic account as to the order of Creation. While nothing transcends its own proper bounds, each type prophesies of better things to come, and finds its meaning above itself. The mineral is for the vegetable; the vegetable for the animal; the animal for the rational. Here Creation enters the temple of knowledge, and becomes conscious of itself. Man is thus not only lord of creation, but also nature's great high priest, through whose knowledge thereof the very "heavens declare the glory of God."

The *certitude* of human knowledge grows out of a constitutional intuitiveness interwoven with the substantial fibers of the human mind. This position is taken and maintained against the sensationalism of Locke and English philosophy in general. Mercersburg Philosophy has no patience with the skepticism of Hume. Man knows that he knows because he knows it. Otherwise his inner consciousness would deceive him, and prove itself an abiding lie. The outer world is a necessary condition for the unfolding of the mental powers, but it is not the source of human ideas. Distinction is, however, made between the *understanding* or discursive faculty and *reason* as the power of apprehension. At this point, it is largely in agreement with Kant and Hegel. The idealism of Fichte and the skeptico-idealism of Berkley are rejected. Man is a microcosm; he knows that there is a world without, because he has the world within him. Self-consciousness and world-consciousness are glorified together in the innate God-consciousness. Man *knows* that there is a God. The "fool" knows better. Modern Agnosticism is the culmination of a chronic lie. Mercersburg Philosophy can the more consistently emphasize its condemnation of this modern heresy, because it long since, at this point, parted company with Kant and Sir William Hamilton, and fell in rather with the philosophy of the absolute as set forth in the German school of Schelling, Fichte and Hegel. Man *can* know God. Distinction must be made, however, between *knowing* and *measuring*. This

distinction is kept in prominent and constant view. We can *apprehend* the absolute, but we can not *comprehend* it. It is an idea of the reason that the understanding can not think outside of the categories of time and space. Here we reach the connecting link between Philosophy and religion. At this point Mercersburg Philosophy passes over into the sphere of, and applies its principles to, Mercersburg theology, which has at its foundation Mercersburg anthropology, viewing man as the fulfillment of all the unconscious prophecies below him, the solution of all the problems around him, and the heir presumptive to all the attainable glory above him.

Heir presumptive? Yes; but a contingency has arisen. Sin has disturbed the normal order of creation, making it groan and travail until now. Philosophy can deal with the problem of human destiny only as it turns on the supernatural, light of Revelation. This is another point emphasized by the Mercersburg School. It applies the principles of its Philosophy to the science of sociology. Christ is held to be the personal, central and archetypal truth of the world. Without Christ, true philosophy is just as impossible as true salvation. He responds to man's reason, as well as to the yearnings of his heart: He is for science as well as for religion: He meets all wants, and masters all problems. In Him the heir presumptive becomes the heir possessive to "the Kingdom prepared from the foundation of the world."

THEMONT, OHIO.
(Concluded next month.)

SCIENCE.
SKEPTICAL TENDENCIES OF MODERN

BY JAMES W. LOWBER, M.A. PH.D.—NUMBER II.

Professor Tyndall and Bain, to get rid of the Christian idea of mind, make matter a double-faced unity, consisting of a physical and a spiritual side. In this position, they are unsatisfying; for they contradict the established definition of matter. All scientific authorities make inertia a universal property of matter. Matter can never move itself. Thomas Paine could not account for motion without admitting the existence of God. Inert matter cannot evolve organization, life, thought, emotion, conscience, and will. Professor Tyndall compares the light and heat of the sun to the light and heat generated by the blacksmith in striking a piece of iron. He claims that if light and heat can be thus generated, vital energy may have a proximate mechanical origin. According, then, to this theory, the blacksmith who hammers out life on an anvil of dead matter from the collision of cosmic masses, will in time produce a blacksmith. This is grave science. The great Professor's argument is a scientific vagary. Look at it, for a moment. "There must be a sun to be pounded, and a blacksmith to do the pounding. There must be intelligence to direct the blows, and a purpose to be accomplished in hammering out light and heat from matter ready made for the purpose. From whence came the matter, the blacksmith, and the guiding intelligence? That inertia is a universal property of matter is overwhelming. It proved from the necessary beliefs of the mind, from common consent, from the agreement of scientists in all ages, and from the results of observation and experiment. The properties of matter and of mind are so unlike, that an attempt to identify them shows the most reckless speculation. The great philosopher, Kant, has said, 'Give me matter and I can form a universe; but give me matter only, and I cannot form a categorical pillar. There is no possibility of spanning the gulf between the living and the not living without a miracle; for, the theory of spontaneous generation has entirely exploded. It has been given up, even by infidels who claim to be scientific. 'The spirit of man is a separate immaterial substance with its own peculiar qualities and attributes. Plato, in his Phaedon, represents Socrates as saying to his friends, in the last hour of life: 'You may bury me if you can catch me. Do not call this poor body Socrates. When I have drunk the poison, I shall leave you, and go to the joys of the blessed. I would not have you sorrow at my hard lot, and say at my interment, 'Thus we lay out Socrates, or thus we follow him to the grave, and bury him.' Be of good cheer: say that you are burying my body only.' This is against materialism: for a mode of force and motion in matter, cannot exist separate from the body. Socrates believed the spirit of man to be a conscious entity, which remained conscious after death.

The most eminent microscopists and physiologists, such as Brown, Carpenter, and Draper, advocate the doctrine of the immortality of the soul. I once put the following question to Dr. Draper in New York: "Do you believe in the conscious existence of the individual after death?" His answer was: "I do not see how it can be otherwise." It is said that the poet Goethe and the philosopher Lockerman were once conversing on the doctrine of a future life. The great poet looked at the setting sun, and said to the philosopher: "Setting, nevertheless the sun is always there: I am fully convinced that our spirit is a being of a nature quite indestructible, and that its activity continues from eternity to eternity." There is something about man more substantial than the body. In 1872 I visited for the first time the falls of Niagara. I became very much interested in the spray-bows above the falls. I would watch carefully the stationary position of a bow while the water would move. What caused the bow? Says one, "The water." It was not the chief cause, or the bow would move with the water. The water was the occasion, and the sun the cause. The material of man's body is changing as do the waters of Niagara; but his spirit is an incorporeal organism which preserves his identity, and beautifies his body as does the sun the waters of Niagara.

LANCASTER, KY.

A PLEASANT CALL.

Among the numerous calls of friends from a distance, none has been more pleasant and enjoyable than that of the venerable Mr. Rudolph, father of Mrs. President Garfield. His eighty years sit lightly and cheerfully upon him, his mind is as clear and his reasoning powers as sound as those of a young philosopher, and we were surprised, after not seeing him for more than a quarter of a century, to find him with all the elasticity and physical vigor of an ordinary man in middle life. Some of our happiest days when a young man, nearly forty years ago, were spent at his house in Northern Ohio, when Mrs. Garfield was a bright, serene and cheerful as his long years have been useful to the cause of truth.

WILFORD'S MICROCOSM.

23 Park Row, New York, Nov., 1883.

A. WILFORD HALL, Ph.D. Editor and Prop'r.

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 Rev. THOMAS M. WALKER. Fountain Green, Ill.
 Rev. Prof. S. B. GOODENOW. Battle Creek, Iowa.

SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourself responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent. EDITOR.

SUBSTANTIALISM EVOLVED.

"THERE is a divinity that shapes our ends, rough-hew them as we may." How truly beautiful, and how beautifully true! We have never realized so fully the almost inspired meaning of the above aphorism as since we have passed through the gradual stages of the substantial controversy from the first publication of the *Problem of Human Life* up to the issue of last month's MICROCOSM. When writing the book the whole field of the discussion was new to us. Our attention then had but recently been called to the substantial nature of all force, and the consequent fallacy of the current theory, by the necessities of the far-reaching and all-embracing system of philosophy now known as *Substantialism*. This broad principle, therefore, forced upon us the necessity of including even *sound* with the other natural forces as a real but incorporeal substance. We could not at first conceive how such thing were possible. But a cursory view of the material substances of Nature, from the densest and hardest—platinum and the diamond—up through the varying gradations of metallic and other solid bodies to liquids, and thence to the gases, ending with odorous particles so attenuated, while yet material, that no chemistry or mechanics can ever collect or condense them into a perceptible pellet even under a microscope, prepared us for the higher but natural advance into the entitative field of absolutely incorporeal or immaterial substances, mysterious and difficult as the problem seemed to be.

Starting here with the action of *magnetism* in forcibly drawing a piece of iron from a distance, equally well through a vacuum or through sheets of impervious glass, we knew intuitively and positively that the magnetic something called *force* which could do this, however invisible or otherwise intangible to our physical senses, must be *substantial*; and being *substance*, it must be immaterial or incorporeal substance, since by passing through sheets of glass, the same as if nothing intervened, it manifestly acts in defiance of all material conditions, though it emanates from a material body. It is utterly inconceivable, to any man who will give free exercise to his reasoning powers, that a piece of inert iron should start from a state of rest and move toward a magnet in opposition to gravity, unless something absolutely *substantial* passes between the two bodies to produce this result. If nothing entitative connects the two bodies then manifestly it is a substantial and physical effect with *nothing* for its cause. And if a physically impervious material substance, like a sheet of glass, may intervene between the two bodies without interfering with such movement in the slightest degree, as is well-known to be the fact, then positively such magnetic force cannot

be a material substance but must be an immaterial or incorporeal entity. How plain is all this to an investigator who will keep constantly in view the fundamental law in science and philosophy that no inert body can move of itself, and that no substantial effect, such as the displacement of a physical body at a distance, can ever take place but by the intervention of an adequate substantial cause! Hence all the forces, including mind, life, soul, and spirit must be incorporeal substances.

Having by this simple and logical beginning secured a foothold and established our position for the existence of immaterial substance upon the immovable foundation of substantial magnetism, we felt that it only required a little consistent and logical elaboration to extend the principle to every force of Nature.

At this stage in our progress how clearly and distinctly did the whole field of Substantialism open up, at least in principle, before our mental vision! There was not a cloud or a rift of fog even to obstruct our view to the final overturn of materialism and the ultimate permanent establishment of the entitative philosophy by which man's existence in a future life may be scientifically established and assured. Though as yet we had not come to grapple directly with the *sound*-problem nor had we even more than a faint glimmer as to how the arguments of the text-books for the wave-theory were to be met and answered, yet we already saw that sound must be an entitative something, and if a something then it could not be the mere mode of motion of that which transmitted it. Having full assurance already that one force, magnetism, was and must of necessity be a real substance, we could not read Nature's great book any other way than to believe, on the laws of consistency and harmony, that all its forces, including light, heat, sound, electricity and gravitation, were equally substantial, and that all we needed was just a little patient research in culling aid from the analogies of science, to enable us to unravel every mystery involved, and answer every objection that might be raised to the new philosophy. Of course we could see that gravity must plainly be substantial if magnetism was, and so must be electricity since it produces magnetism as one of its substantial effects. Then it was but a short and easy mental step to take in heat, as another incorporeal substance, and a still easier one to pass from heat to light, and thus re-establish the old emission theory of Sir Isaac Newton on the new and rational basis of incorporeality, and not as he held it on the manifestly untenable basis of almost infinitely attenuated material light-particles. With this broad and fundamental distinction thus ratified between material and immaterial entities, which many minds even yet find such difficulty in

grasping, and with this dual classification covering the whole realm of Nature from the Spirit of God down to the adamantine rock, our work was more than half done when fairly begun.

But still *sound* seemed to be the most difficult to reduce to a substantial basis, and in this way wrench it from the grasp of materialistic science which necessarily makes the imponderable forces of Nature but modes of molecular vibration. Instead of holding sound to be but the vibratory motion of the conducting medium, Substantialism required it to be a real, incorporeal substance conveyed by such medium somewhat as electricity is conducted along a wire, while any tremulous motion of the air or other body conducting sound would have to be but incidental, as the result of the vibratory motion of the sounding instrument in the act of generating the tone. This incidental tremor of the air near the sounding body, according to Substantialism, could no more be a part of the sound itself than could the incidental tremor of the wire near the dynamo-machine be a part of the electric current passing through such conducting medium.

But notwithstanding this rational way of looking at sound, it was a patent fact that there were many other surface phenomena or appearances in the generation and transmission of sound, besides the tremor of the conducting medium, which seemed to favor the received theory. These made the idea of attacking that theory and attempting to relegate sound to the domain of Substantialism appear futile, if not almost preposterous, especially in view of the fact that these appearances had been strong enough to hold the minds of scientists to this single view during all the recorded investigations of past centuries. What folly, thought our friends, to try to break down a theory thus fortified, and thus believed in by the greatest minds of all civilized ages as unquestionable scientific truth! But what were we to do in the premises? Substantialism required *Sound* to be included in the cluster of its crown-jewels, and the new departure could not be a true, consistent, and universal Philosophy without it. To leave out Sound would be equivalent to leaving out everything; for if Sound be only a mode of molecular motion so must be light, heat, and electricity; and the materialist might then logically insist that the same law applies to the soul or spirit of man, making it but the motion of brain-molecules, and in this way he might, as he actually does, rationally neutralize every argument that can be framed from Science or Nature for the immortality of the soul, or the future existence of man, since *motion* is *nothing*, in a substantial sense, and necessarily ceases to exist, being only a phenomenon, as soon as the moving body, whether it be a mountain or a molecule, comes to rest. How

necessary, then, to keep up this distinction between the *motion* of a body and the *substantial entity* which moves, as well as the force which moves it,—a manifest distinction which half of our critics do not seem capable of making. *Force*, then, let us remember, is not *motion*; neither is motion force. The one (force) is the cause of the other. The one (force) is necessarily entitative, as Substantialism insists, while the other is only phenomenal, and necessarily has no existence after the force which causes it ceases to act, any more than can a shadow exist after the obscuring body which had impeded the light is removed.

Hence, in this start of the new departure it was impossible to yield to scholasticism even this single question of sound and then try to maintain the slightest show of argument for a broad and consistent substantial philosophy. But how were the appearances in sound-phenomena, which had deceived the nations and misled the greatest scientists of the world for more than two thousand years, to be explained if the substantial view of sound were really the correct one? Or could these appearances be explained at all? For our encouragement in making the trial we had a splendid example on record in the utter downfall of the Ptolemaic system of astronomy to which all the appearances of the solar system and stellar heavens seemed to point favorably,—so favorably that for many centuries no mind was capable of looking beyond those appearances to the real truths of astronomical science and to the real motions of the heavenly bodies, though a few minds in different ages had caught glimpses of such possibilities without being capable of carrying them out to their legitimate result. But at last these appearances, which had so long mislead the world, were forced to give way to the profound judgment of a scientist who solved the problem by starting out upon a broad and true principle of philosophy, namely, that Nature's laws were of necessity consistent and harmonious, and that it would be almost infinitely absurd to suppose that millions of globes as large as our earth if not larger should make the earth the centre of their motions and revolve around it every twenty-four hours, when by a simple rotation of the earth the same result would be achieved. This basic principle, like that of Substantialism, solved the mystery, and the superficial appearances of the visible heavens were at once resolved into the simpler and more consistent principle of philosophy which now prevails, and which made the earth revolve on its axis, leaving the apparent phenomena the same. The result was, that gradually, under that fundamental principle, one by one the appearances of solar and stellar motions gave way to scientific and real explanations till finally after a long contest, the new solution has swept the heavens as well as

the minds of scientists clean of the erroneous view caused by such misleading phenomena, just as we believe in the not very distant future, Substantialism, with its broad and consistent principles of Philosophy, will sweep the schools and text-books of the superficial appearances concerning sound that have so long borne sway over the minds of physicists. To the achievement of this result a portion of each number of THE MICROCOSM, as heretofore, will be set apart.

The chief misleading appearance in the generation and transmission of sound, and the one which, more than any other, tended in the first place to establish the wave-theory and which has since, during more than 2,000 years, made it appear self-evident to scientists, is the very problem we discussed so elaborately last month in our reply to Prof. Stahlr, namely, the apparently swift motion of a string or tuning-fork's prong when sounding. The humming tone of the string, with its blurry appearance, was well calculated to deceive the very scientific elect, just as the daily circling of the sun, moon and stars around the earth was calculated to deceive the greatest scientific minds up to the time of Copernicus. Even the acute Tyndall, the profound Helmholtz, and the cool-headed Mayer have all supposed that the prong or string must travel through the air with great velocity, as was naturally supposed to be necessary in order to send off the air-waves that were universally believed to constitute Sound and to produce hearing by dashing against the ear-drum, thus causing it to vibrate in a somewhat similar manner to that of the sounding body itself. These writers have all so taught us in their text-books, as has every other authority on the subject ancient or modern. Hence it is little to be wondered at that ten thousand professors of physics in our colleges and universities should smile with a broad scientific sneer when they learned that an obscure upstart in natural philosophy in New York had denounced the wave-theory of Sound as a monstrous fallacy of science, and that instead of the prong of a tuning-fork "swiftly advancing," as Tyndall teaches, it does not travel at its swiftest velocity faster than a little child can walk! So undoubted was the current view held that had either of the three great authorities named been asked, before seeing the *Problem of Human Life*, how swiftly a prong traveled when sounding, we have not the least doubt he would have answered—much swifter than a stone can be thrown from the hand. Tyndall tells his readers to behold the prong "swiftly advancing," and to note how it "carves the air into *condensations* and *rarefactions*." Helmholtz says it goes "very much faster" than the motion of a "pendulum," as it must do in order to condense the air and send off sound-waves. This was the prevailing view among

scientists caused by this deceptive appearance, and it is a startling fact that in all the discussions of the subject in works on acoustics for hundreds of years, not a dissent or doubt occurs up to the appearance of the *Problem of Human Life*. Even now professors of physics in all the colleges of the world believe and teach the same superficial fallacy, except where our arguments have been seen and read, and even in such cases the professors cannot believe it possible that Tyndall and Helmholtz were so badly mistaken about the prong "swiftly advancing" till they have gone over our calculations and repeated the demonstration for themselves. It seems almost incredible that after centuries of investigation we should be the first to calculate and measure the actual velocity of a prong's travel and thus show, as now finally demonstrated, that instead of "swiftly advancing" it will produce audible sound when moving through the air one thousand times slower than a snail! This demonstration was given last month in reply to Prof. Stahr, where any one can learn, to his amazement if he be a wave-theorist, that a prong will sound distinctly when not traveling at a velocity of the one *two-hundredth* of an inch in a minute! Think of the idea of a prong sending off air-waves at the velocity of sound—1,120 feet in a second—when not moving at the rate of the breadth of a hair in a whole minute, and you will get a glimpse of the monstrous character of the fallacy that has been so long imposed upon the scientific world. Yet this science (?) teaches that the prong thus moving and thus producing audible sound must necessarily send off these air waves with precisely the same velocity as when it is traveling at its greatest amplitude, or *one million* times swifter! Can any man who is capable of reasoning philosophically desire stronger proof that sound must consist of something besides air-waves? Can he doubt that sound must be a real incorporeal substance analogous to electricity, and which travels by an analogous law of conduction,—equally swift whether the pulse be strong or weak?

But how strange and remarkable has been the evolutionary progress made on that most important discovery of the prong's exceeding slow travel, since our first publication of the *Problem of Human Life*! At that time, when attacking the wave theory upon this vulnerable point, we innocently conceded the prong's amplitude to be a full *sixteenth* of an inch at a swing, and even admitted that at the centre of each swing the velocity was considerably greater than the average rate of travel. How little we knew then about the secret of finding the joints in the armor of our opponent! Instead of taking the prong's greatest amplitude for our standard, as we then did, and thus giving the theory the benefit of its greatest rate of travel (six-

teen inches in a second), why did we not take the smallest measurable amplitude and the very slowest rate of motion of the prong's travel while still producing audible sound, as we did in our "demonstration" last month, and thus kill the theory at a single blow by showing that the fork produces audible sound when traveling only at a velocity of the one *ten-thousandth* of an inch in a second, or only at the rate of *one-third of an inch in an hour*? Why did we not do it? At first we confess that we thought of nothing but the largest possible amplitude of the fork's swing and its greatest rate of travel in our extreme desire to deal fairly with the theory, though later on, when the book was in type we saw that we had been more than generous to wave-theorists without really knowing the extent of our own generosity. We concluded, however, to let it stand as it then was, to call out discussion by scientists and thus wait for developments. And here is where the *divinity* seemed to shape the ends of that roughly-hewn discussion. Had we been able at that time to present the "demonstration" which we gave last month, and in all its mathematical and logical force, we firmly believe that the wave-theory would have been so effectually squelched at the start as to have prevented all subsequent criticism even of our defective arguments, which we admit to be many. In such event we would have been deprived of the intellectual friction which has since been of so much benefit to us in brightening our ideas by the many discussions which professors have been emboldened to undertake, and which they would not have undertaken at all only that they regarded the wave-theory not dead, even if it had been badly crippled. More than a score of professors of physics in different colleges of the country, ambitious to make their mark by squelching the *Problem of Human Life*, have attacked this argument against the wave-theory and have paraded our admission that the prong-travels a full *sixteenth* of an inch at a swing, and have then insisted, by allowing for stops at the ends of swings and for swifter travel at the centre of each vibration, that it may even yet travel swift enough to throw the air into "condensations and rarefactions" as the theory actually requires. But mark: the shaping divinity naturally induced every professor who thus put himself on record to admit that without very "*swift*" motion of the prong or string, as Tyndall teaches, no "condensation" could occur, and consequently no "sound-waves" could be sent off according to the wave-theory. (See Prof. French in last March number, and Prof. Stahr in Oct.) Little did those professors know when recording these fatal admissions the annihilation Providence was reserving in store for them and their theory, as seen by our "finishing demonstration" last month. Hence they were tempted into

the controversies against the 'mischievous book' which they would otherwise have avoided as they would the deadly upas. As it was, thousands of scientific students were induced by those discussions to procure and read the book itself, whose attention, in all probability, would never have otherwise been called to the new philosophy. Hence the fact of our incapability of grasping at the start the full extent and bearing of the discovery we had made, has left the question open and been the means of selling many thousand copies of the "*Problem*" which otherwise would never have seen the light. This progressive Evolution of Substantialism has been very strange as well as gratifying, and even yet our recent crowning demonstration, startling as it is, appears only to have begun to reach its limit of destructiveness to the wave-theory—if we may judge by the hint given by Capt. Carter elsewhere in this number (page 105). So it has been from the first announcement in the "*Problem*" of the fact that the prong's swiftest travel is really but very slow motion. After that announcement, as each new controversy was forced upon us, we succeeded in reducing the fork's rate of travel to a less and less speed; thus tightening the cords around the wave-theory. With Prof. Reppert we had figured it down to only *three inches* in a second as its maximum rate of velocity. With Prof. French, by new experiments described in *THE MICROCOSM* of last March, we had demonstrated that the prong would sound audibly when not traveling at the rate of *one inch* in a second, or a distance to and fro of more than the *one-thousandth* of an inch at a swing. This we justly regarded as exceedingly *slow* motion, instead of "*swiftly advancing*" as Prof. Tyndall describes it. At that juncture we thought we had touched the lowest conceivable velocity at which a prong could travel and still produce audible sound. But the *shaping divinity* had not yet reached the culmination of the new departure for the final catastrophe of materialistic science and for the stamping of the great seal of approval upon Substantialism. It remained to unfold a still more wonderful result, namely,—a simple method of measuring with absolute precision the prong's to-and-fro motion while audibly sounding *and when not traveling at a velocity of more than a small fraction of an inch in an hour*, thus adding the climax to the evolutionary and revolutionary work. This climax which was thus reached, at least in principle, completes the *Evolution of Substantialism* by showing conclusively that sound can consist of no motion of the air whatever, and therefore that it must be an incorporeal substance analogous to the currents of electricity.

Substantialism thus having culminated in the final overthrow of the wave-theory, we may now reasonably believe that extended opposition to the substantial philosophy, especially from respectable

or well-informed sources, will virtually cease. No rational or possible plea can be urged against the substantial nature of the physical, mental and spiritual forces that move and actuate our bodies after sound is admitted to be a substantial entity, as it must be with the current view of Sound as a mode of motion broken down. Then with Substantialism thus established upon the broad scientific and philosophical principle that all force is substance we are led up to the author of force, as a substantial First Cause or the entitative God of Nature—since substantial force, whether physical or mental, can only come from a substantial fountain. And if *intelligent* force thus proceeds from this Fountain, then God must be a *substantial Intelligence*, or intellectual substance itself—hence a *Personal Deity*.

Thus Substantialism, forming as it does the pivotal point upon which all true religious belief must turn,—since all religion should and does recognize in some shape a substantial future for humanity,—we have in the new philosophy at least one universal religious and scientific article of faith as a bond of Theistic and Christian fellowship upon which all who wish to do right and to live hereafter may cordially unite and shake hands. No article of faith ever propounded by man is so Catholic and entirely unobjectionable as this, since no surrender of peculiar theological tenets is required of its adherents, and no church-relationship need in any way to be disturbed. With Substantialism as our watchword, ten thousand and invisible and intangible entities confront our intellectual vision on every hand throughout the broad domain of Nature, signaling, like so many beacon-lights the voyagers of earth to a substantial realm that lies beyond, thus permitting us, with an abiding faith as seeing Him that is invisible, to look through Nature up to Nature's God.

PROF. CATHER IN THE "WEATHER INDICATOR."

For several months past Prof. Cather has been writing articles against Substantialism in his paper which he calls the *Weather Indicator*, and in which he claims to predict the weather a month or more ahead of publication, for the benefit of unsophisticated farmers and other gullible parties whom it may concern. The professor is a genius in his way, and as cheeky as he is versatile. We use the term "*cheeky*," slangy as it may sound, since no other word in our dialect so fully conveys the impudent character of that pretention which would thus impose upon the credulity of innocent country people by claiming to indicate the weather a month in advance of date. And one needs only the fact of this "*Weather Indicator's*" ridiculous claims to meteoric wisdom to be able to judge in advance pretty nearly as to what kind of articles on science to expect—such as those for instance on Substantialism, the nature of the imponderable forces, the nature of matter, the philosophy and action of the senses, etc. Although

these queer papers give forth occasional scintillations of original thought, they abound in so much crude incongruity, so many short-sighted self-contradictions that the whole discussion, when intelligently analyzed, presents just about such a jargon of sense and nonsense—such a hotch-potch of truth and error—as might be looked for from a cranky weather-prophet, or one of the modern tribe of clairvoyant fortune-tellers.

The series of articles, which it seemed were to be endless, having apparently subsided in the October *Indicator*, we now venture to reply as briefly as possible. We should never have deemed these articles—of half-praise of us, and half-assault upon our positions—as worthy of notice, but for the fact that the professor, using our list of contributors, has sent his crudities to them gratis and monthly, trying thereby to make the friends of THE MICROCOSM think that he really had discovered points worth noticing in his raid against the Substantial philosophy. This forces us to point out the fallacious character of his various attempts at argument, and will necessarily require considerable space. Our readers can well afford to excuse this, since every exposition of erroneous doctrines in science involves the presentation of valuable truth in order to counteract them.

We begin by making the following extract from the May number of the *Indicator* in which the writer is treating of the "*Abstracts of Matter and Substantialism*." For refined, transcendental, philosophical nonsense here is a specimen:—

"The immensity of space, the intensity of darkness and coldness are incomprehensible; but in the relations these bear to matter, they are by no means so mysterious. Gravitation, light, heat, sound, motion, odor, and color, all address directly our senses, and, therefore, are rendered to a degree intelligible. But matter—that which we are apt to think is more familiar, and with which we imagine we have the greatest knowledge—is utterly incomprehensible. We literally know nothing about it. All the knowledge we can possibly have of external or substantial objects is such as can be gathered through the medium of the senses. This being the case, how can we comprehend matter? We have some knowledge of its purpose, use, and laws, but none of it; for we have never seen it, felt it, or heard it. Neither have we tasted nor smelt it. We have observed its color, measured its bulk, or its volume, examined its shape, heard its sound, and tasted its flavor; but in no respect have we been permitted a closer relation to it than such as is derived from an acquaintance with its abstracts, or the laws of its being."

Thus we have it, that "we literally know nothing about" matter, yet we have a "knowledge" of "external substantial objects!" What are these external objects but "matter"—material "objects?" "Gravitation, light, heat, sound," etc., "address directly the senses, and therefore are rendered to a degree intelligible." But "matter," he says, we "literally know nothing about!" Why? Because "all the knowledge we can possibly have of external or substantial objects [matter] is such as can be gathered through the medium of the senses,"—the very way "gravitation, light, heat, sound," etc., "are rendered to a degree intelligible!" Reader, look at the extract for yourself. Thus we have equal "knowledge" of material or "substantial objects" and the "abstracts of matter" or imponderable forces, all our "knowledge" of either being derived "through the medium of the senses"; yet while the latter are thus "rendered to

a degree intelligible," matter "*we literally know nothing about!*" If a more flighty farago of contradictory trash ever emanated from the brain of a pretended philosopher, we have failed to come across it.

We are thus taught that we really have a "knowledge" through our senses of a "substantial object" or material body as we have of sound; but "we literally know nothing about it!" If we "literally know nothing about" what we have a "knowledge" of, and what addresses the intellect through the five senses, then we are self-contradictory know-nothings both as to matter or anything else. What a jumble! "Immensity of space, intensity of darkness," etc., he says are "incomprehensible," except in the "relation these bear to matter." Well, as we "literally know nothing about" matter, how does their "relation" to matter help their incomprehensibility? Possibly Prof. Cather got this mixed up with one of his "paroxysmal" explanations of the weather "a month ahead!"

He says we have "some knowledge" of the "purpose, use, and laws" of matter, but "we literally know nothing about" matter itself. Further on he says "we can dissect and analyze matter, but after all we only reach its components or the infinitesimal proportions of matter." Well, that surely is all we need, for matter is clearly constituted of its "components" or "infinitesimal proportions," and if we can "reach," "analyze," and thus obtain a "knowledge" of them, then it is ridiculously self-stultifying to say that we know nothing about matter. He further goes on with his unintelligible farago:—

"We only touch the object [*the material object of course*], its form, surface. Its external qualities are sensible—smooth or rough,—its bulk or weight are ascertainable to the touch," etc. (Grammar his.)

Now we assert, in defiance of all this rignmarole, that if we touch a material "object" we touch the matter of which it is composed; and if the "bulk" of such object is "ascertainable" by the sense of "touch," then we can "ascertain" or have knowledge of the matter itself, since the "bulk" can certainly consist of nothing but the quantity of matter that constitutes it! If we touch the "surface" of a material body we touch the "matter" of which the body consists; for if the "surface" of a body is not the matter then its interior is not and there is no matter about it. If its "surface," "bulk," "components," "infinitesimal proportion," can all be "analyzed," and ascertained, then we do know something about the matter of which a body is composed, for these most assuredly constitute the matter itself. Take this whole statement, and carefully analyze it, and it will be found to consist of nothing but refined self-contradictory nonsense in an effort on the part of the writer to appear profoundly philosophical and astute. As well might he say that we can touch the "surface" of an apple, we can ascertain its "bulk," taste its "flavor," smell its "odor," determine its "weight," analyze its "infinitesimal proportions," learn all about its "components," its "purpose, use, and laws," can eat and digest it, yet that we "know absolutely nothing" about the apple itself! Had he attempted deliberately to contradict himself as many times as possible in a single effort at philosophical reasoning, he could not have succeeded more admirably. Plainly speaking, and to sum up this whole incongruous jumble of transcendental stuff, if we "literally know absolutely nothing" about matter, then we do not know that it exists, of course, or that there is any

such thing as matter in the universe. We are willing to admit that our weather-prophet tells the truth so far as he is concerned,—that he “literally” knows nothing about “matter” and very little about anything else of which he writes, especially the “paroxysmal” weather a month ahead.

We next take up the July *Indicator*, in which the Professor tries to grapple with *Substantialism* based upon sound as “substantial emanations” in contradistinction to air-waves as universally taught. But to show his entire unfitness even to attempt a criticism upon this phase of Substantialism, he misapprehends and misstates an important historical fact at the very start, which vitiates his entire reasoning. Take the following :

“What is sound? Mr. Wilford Hall maintains that it is a substance—that is an emission of corpuscles. *Acousticians once taught this doctrine, but abandoned the theory long since as entirely inconsistent with any known fact connected with the nature of sound.*”

So glaringly foundationless is this statement, that it is a fact known to all well-informed persons that the *Problem of Human Life* contains the first intimation ever published that sound consists of substantial corpuscles. No acoustician before that time ever taught it or wrote it; and we challenge Prof. Cather, as we have challenged all others who have made similar reckless assertions, either to name the record where such teaching is to be found or else acknowledge their mistake as publicly as they have made it. We do not say that the Professor intentionally misstated the facts, but we wish to indicate that such statements are a fair indication of the reliable character of the “*Weather Indicator's*” general teaching on all sorts of subjects. If he cannot give a more reliable indication of weather events a month in advance of date than he can of past and well-known historical facts concerning acoustical science, farmers had better stand from under.

Prof. Cather denies our substantial view of sound as a matter of course, simply because he does not comprehend it, supposing us to teach that sound consists of the material particles of the bell or other sonorous instrument! If he would take the trouble to read up a little he would not be so intensely in the dark. He has never yet caught the truly philosophical and elemental idea that substance may be of two general classes, corporeal and incorporeal, material and immaterial, &c. In fact, all through his half dozen articles against Substantialism, this error stands out as among the most prominent of his superficial misapprehensions. The truth is we regard this fundamental distinction between material and immaterial substance as the basis of all correct knowledge of the physical laws. Without it Nature itself is pitch-darkness. It is upon this demonstrable distinction and classification that Substantialism rests, and from whose broad foundation it issues its challenge to materialistic science as the reader can see exhaustively argued in our leading editorial in this number. To a mind really philosophical this natural and beautiful distinction should be as clear as the sunlight of heaven. Upon the mind of Prof. Cather, however, it has not yet made the first impression.

Take electricity, for example, which is manifestly a substance; yet it by no means follows that it consists of the material particles sent off from the battery or dynamo machine that generates it. On the contrary it is an incorporeal substance some-

what analogous to sound and like sound, though coming from material substances, it will pass through solid material bodies as conducting media, each by a law of conduction of its own, and (being immaterial substance) without any physical motion whatever of such conducting media. Not being instructed in the matter he attempts to discuss sufficiently to grasp this important distinction in Nature's diversified substances, Prof. Cather naturally rejects the corpuscular theory as absurd and impossible; and who would not have so concluded had we really assumed such a preposterous position as that sound-corpuscles are gross material particles of the “*metallic substance*” (as Prof. Cather charges, in July number, p. 5, middle column), sent off from the “bell” or other sounding body? How unpardonable for any writer, save one who really supposes himself a weather-prophet, to have imagined us capable of believing and teaching that these material particles of “*metallic substance*,” could actually travel through solid iron 19,000 feet in a second? No wonder that a man who could so egregiously miss our whole position on the meaning of “*incorporeal substance*” as to make it identical with “*metallic substance*,” should go on and oppose a *Substantialism* really based as he supposed on such material particles! Hence, every argument he has pretended to urge against Substantialism has only to be read over again in the light of his own absurd conception of substance, as he thought we must hold it, to make the soberest judge laugh outright. This single drop of prussic acid has thus been made to poison the whole cask of water. Hence our seer, being compelled to reject the wave-theory by the force of our arguments against it, and being entirely at sea on the meaning of “*substantial sound-pulses*” or “*corpuscular emissions*,” he resolved on a new-theory of sound somewhere between the two that he thought would settle the question. Here is his promising programme :

“If the corpuscular theory is correct it is maintained that the method of transmission proceeds directly from the movement of corpuscles, and is inherent in these. Acousticians, however, have taught the wave-theory of transmission; and as the latter is now the accepted theory and taught in all the text books, it would be superfluous and a waste of our limited space to repeat the exposition of this theory here. We reject both theories, and suggest a new one which we think more consistent, because more reasonable.”—(July *Indicator*.)

Now, reader, what think you is this “new” theory that is to strike the “consistent” and “more reasonable” mean between the corpuscular and the wave-theory, both of which he rejects? Startling as it may seem, it turns out to be no theory at all. It has not one new idea nor symptom of an idea in it. He simply takes the air-waves or atmospheric disturbances of the old theory and makes them so small by subdivision that they cease to be undulations, thus reducing them to mere atmospheric “tremors” under the name of “*vibratory infinitesimals*.” Here is one of his sentences in which he expresses his “new” theory:

“Sound results or is conveyed by vibratory infinitesimals, notwithstanding the wave-theory may be exploded. But these infinitesimals, substantial as they are, are material as we observe.”—(June *Indicator*.)

Another way in which he expresses the same idea, is as follows :—

"The corpuscles of the air are *jostled* and become *tremulous* one against the other.—(July Indicator.)

Now we protest most solemnly against this false pretense of claiming a "new" theory when it is only a slight but natural modification of the present exploded theory, and which all wave-theorists resort to whenever they are driven from the air into solids or liquids as sound-conducting media. They invariably change from wave-motion to "molecular tremor," as they are forced to do, or else give up their assumed "mode of motion" altogether. Prof. Cather, by taking the well-known features of the wave-theory as urged by all acousticians for solids and liquids, and by simply applying them to the air, is guilty of the smallest and most pitiable kind of plagiarism; and ought to be prosecuted by Tyndall, Helmholtz, and Mayer for obtaining a "new theory" under false pretenses. He knew that sound traveled with great facility through water and iron, for instance, and he knew that no wave-theorist when pressed (however inconsistent it might be) pretended that it so traveled by waves or by anything more than the "tremulous motion" of the material molecules thus conducting it. But he was hard up for a "new theory," so he proceeded to manufacture one by cutting up the air-waves of the old theory into what he calls atmospheric "infinitesimals," or "tremulous vibrations" of the air-particles as they are "jostled" "one against the other," and thus unscrupulously thimble-rigs it off upon his unsophisticated subscribers as a *new theory* and as a fit companion-piece of his "paroxysmal" weather indications, which it doubtless is. Poor Cather really thought if he could only get the atmospheric disturbances of the old theory cut up fine enough he would ultimately get them so small as to stand on new ground, and then could manage to escape the charge of plagiarism—not knowing that he who steals a hundred pennies, one at a time, is just as guilty of stealing a dollar as if he had taken them all at once. As well might he try to claim a new substantial theory by cutting our sound-corpuscles up into quarter-sized substantial "infinitesimals"! It would be just as original and just as creditable, as what he has done. But fortunately we have put up the bars against all such scientific plagiarists by supposing as a part of our theory the subdivision of these same incorporeal sound-corpuscles to infinity to enable sound to diffuse itself in all directions, turn corners, etc., so that we need stand in no fear of the stealing of our substantial corpuscular thunder even by a plagiaristic weather-prophet. This warning note will be apt to put the country on its guard.

But Professor Cather is so very anxious to keep clear of the wave-theory, and at the same time to occupy new ground, that he flatly contradicts himself by first teaching that the air-particles do not stir at all in conveying sound, and then immediately after that they do stir. This is no misrepresentation. Here are his words, from the July number, page 5:—

"Not a particle of air, if we take the air for the transmitting medium, is *moved* out of its place, not a particle is lifted," etc.

Then in the very next sentence, as already quoted, he says:—

"The corpuscles of the air are *jostled* and become *tremulous* one against the other."

If this latter half of the contradiction is not the wave-theory merely ground over a little finer than

we have lost all idea of the meaning of words. Webster defines "jostle" to *shake—move unsteadily—totter*, etc. What a fraud upon his subscribers to call this self-contradictory stuff a "*new theory*"! In the name of reason, did any one ever see two men "jostle" each other in the street, and neither of them "move"? If two men cannot, neither can two *mice*, two *midges*, nor two *molecules*. But our muddled prophet really believes he has struck a big thing as a new theory by having the air-particles "jostle" each other without "moving," and keep up a "tremulous" movement against each other without "stirring"! Joseph Cook's favorite illustration is that even God cannot open and shut a door both at the same time in the same direction. But Prof. Cather beats the Almighty by making two air-particles *jostle* each other with a tremulous motion without either of them *moving* or *stirring*!

After uttering the above, he says:

"To our mind this appears a simple exposition of the whole subject of controversy; yet we do not expect it to be at first as clear to the conception of the reader, as it seems to us."

We can not tell how such a flat self-contradiction "seems" to a man who really thinks he sees the weather a month in advance, but it "seems" to us an indication of the shallowest kind of sciolistic stupidity unworthy of a half-grown boy.

However, as we anticipated, before he gets through, he contradicts even his claim to a "new" theory, ingloriously gives it up, and actually admits that his was only intended as a "*modification*" of the wave-theory. Here it is from the October number:

"Now to rest this reply to Mr. Hall, until we hear from him, it remains to be added that *we do not assail the wave-theory of sound*. It may have been conceived in error; it may be correct, with errors in the method of its discussion. *Our object has been to suggest a modification of the theory*, if in any part it should prove false."

How prodigiously funny this "seems to us"! A couple of months before this, his "new theory" of making the air-particles *stand perfectly still* while *moving tremulously*, and *not stir* while *jostling each other*, seemed clear to his mind as "a simple exposition of the whole subject of controversy." Now all of a sudden—"we do not assail the wave-theory"! "Our object has been to suggest a modification of the theory, if in any part it should prove false"!

In sober earnest this "seems to us" too pitiable to be pressed, if only Cather were involved. For six months he had been opposing the wave-theory, pretentiously claiming to have supplanted both it and the corpuscular theory by a "new-theory" of his own unlike either; and now, after writing about it till "it seems to us" neither he nor his readers knew what he was driving at, he mildly throws up his hands and holds out the white flag to the text-books! We heartily congratulate his rural subscribers. His acoustical ideas and his "paroxysmal" weather indications a month ahead are most appropriately published together in the same sheet.

This collapse of the pretentious "new theory" of sound only goes to prove how vain it is to try to find any middle ground between the current theory as a "mode of motion" and the substantial philosophy, which makes sound a real incorporeal substance analogous to the substantial currents of electricity. And it is only another but ~~forced~~ acknowl-

edgement of the impregnable basis upon which the substantial philosophy now rests.

And here we wish to place permanently on record for the benefit of the scientific world in future generations (as we believe Substantialism to be for all coming time while books are read), that the overthrow of the present wave-theory of sound, if conceded universally, as we think it is soon destined to be, must absolutely preclude the possibility of any other theory taking its place save that of corpuscular emissions emanating from the sounding body and generated by its molecular tremor, somewhat as substantial electric discharges are generated by the action of a battery or dynamo machine, and carried off by an analogous law of conduction. On this scientific prediction we willingly risk our posthumous reputation.

We have already intimated that a philosophical plagiarist who would slightly modify the wave-theory by reducing its atmospheric disturbances to smaller movements of the air-particles, and then proclaim it as a "new theory" of his own, was a dangerous customer to run at large in a scientific community, and that we might reasonably look for an attempt to steal our corpuscular thunder and palm it off on the deluded patrons of the *Weather Indicator* as his own discovery. Sure enough, on reading the last issue of his paper (October) we find that he has done this very thing, and goes on to describe the true philosophy of the generation of sound as his own explanation copied substantially from the *Problem of Human Life*! Damaging as this charge appears to be we are forced to substantiate it, and thus as far as possible aid in opening the eyes of those who have placed the least faith in his ridiculous weather prophesies. Here is his claimed law of sound-generation which, so far from agreeing with any kind of "modification" of the wave-theory can only be made to harmonize with the doctrine of corpuscular emissions:—

"But we will here reiterate our statement that the vibration which produces sound is not the motion of the sound instrument, but the vibration of its molecules; and the transmission of sound is not in any movement of the body transmitting it, but in the vibrations of its molecules. The swinging of a pendulum—the rapid movement of a body—is not such a vibration. The sound is sent off not from the movement of its prongs [as the wave-theory clearly teaches] but by the vibrating impact of a tuning fork's molecules."

Now, to show where our weather seer obtained his important law, read the following which we reproduce from the *Problem of Human Life*, page 93, verbatim, *italics* and all, just as published six years ago:—

"The law governing the generation of tone by a vibrating fork or string may now be concisely stated as follows:—

"It is not the mechanical effect of the numerous short motions back and forth on the surrounding air which generates the tone of a fork or string, but it is the molecular effect of the sudden stops and starts on the atomic structure of the instrument itself, causing thereby the emission of the substantial pulses we call sound, while the atmosphere, wood, water, or iron, through which they pass is but their conducting medium,—any motion of such medium, caused at the time by the vibration of the sound-producing body, being but incidental."

I call the attention of physicists to this important law, embodying, as I conceive, the true philosophy of the generation of tone, here for the

first time announced; and I earnestly solicit their impartial judgment on the subject, in view of what has been and what is yet to be offered against the theory of wave-motion,—which, up to the present time, is the only hypothesis ever framed to solve this difficult problem of sonorous propagation."

Had Prof. Cather been consistent after substantially copying this law of sound-generation, thus admitting it to be by the molecular action of the metal of the tuning-fork instead of by the bodily swing of the prongs, as the wave-theory teaches, he would have landed himself squarely upon Substantialism and been happy. But it was not in him to be consistent or coherent, so he concluded to make a general mess of his stolen law by having these molecular motions of the metal send off smaller sized atmospheric vibrations than Tyndall teaches and thus end the matter, as he finally had to confess, in "a modification" of the wave-theory! Our pity for the professor is only surpassed by our sympathy for the readers of his rickety sheet.

But how could a man, who has so little true knowledge of science, be expected to achieve anything other than the foregoing series of fiascos. As a specimen of his want of an elemental knowledge of natural philosophy he urges several times in different parts of his paper that without the "infinitesimals" of the air as a medium, *light could not travel*. Here is one quotation from the September number:—

"The air is the medium of the transmission of these impressions in both instances [sound and light], for without this medium of transmission we could neither see nor hear."

Yet the smallest boy in a philosophy-class knows that we see all objects with the same exactitude through a vacuum as through the air. Now will this *Weather Indicator* please indicate in its next issue how the light of the Stars manages to reach our atmosphere through the great interstellar vacuum without the air as a "medium of transmission?"

But there is one feature of his attack upon Substantialism which needs more than this kind of exposure of self-contradiction and want of scientific knowledge. We refer to the August number in which he tries to break through our claim of a beautiful and harmonious analogy existing between all the five senses as regards the manner in which the different sensations are received and conveyed to the brain. We claim, as elaborately urged and illustrated in the *Problem of Human Life*, that substantial contact is admittedly the cause of sensation in the three lower senses,—feeling, taste, and smell,—and that it is but reasonable to assume that the next two higher sensations, hearing and sight, are produced in an analogous manner, and not by an abrupt change of nature's programme from the real substantial contact of the thing sensed to a mode of motion of its conducting medium. Prof. Cather begins his attack by quoting a small part of our statement in the "*Problem*," page 227, which we will here first copy:—

"He recognizes, in carefully investigating the phenomena of sound, an intimate and connected correlation linking all the senses into one beautiful and homologous concatenation, from the lowest to the highest; and rationally concludes that if the first three—touch, taste and smell—depend for their sensations, as the whole world admits, upon the absolute contact of substantial corpuscles, that it is unwarranted and illogical in the highest de-

gree, unless from overwhelming facts to the contrary, to assume that the remaining two senses—hearing and sight—should constitute a departure from this inauguration of Nature's plan, and thus abruptly sever its analogical chain.—*Hall on the Nature of Sound.*"

He then goes on to dispute this analogy, and denies that the whole world admits it in the three lower senses, and insists that touch is not analogous to smell in the substantial production of the two sensations because the direct contact of the body touched and felt is so entirely different from the manner of conveyance of odorous corpuscles from a distance to the nasal membrane, &c., thus entirely misconceiving and losing the point of our claimed analogy, as the reader will see by carefully reading his extract from our book. We know very well that there is no similarity between the transmission of the odor of a distant rose and the feeling of a stick of wood by its direct contact with some part of our body. He has, we repeat, in his usual crude way of grasping ideas wildly missed the spirit and intent of our assumed analogy. We never so much as thought of there being the least analogy in the manner of "transmission" of the various substances causing sensation, against which our critic verily fulminates his harmless batteries of ridicule. Wave-theorists are the ones justly chargeable with this attempt to frame an analogy between sound and light, for instance, in their manner of transmission, and hence they had to invent an all-pervading *ether* that there might be something to be thrown into light-waves corresponding to sound-waves of air! But we knew, and so wrote in the "*Problem*," that in the manner of transmission there existed no necessary analogy whatever, each traveling by a law peculiar to itself. Look at him as he erects his cob-house to see how easily he can knock it over:—

"Let the reader bear in mind that the question at issue is the *method of the transmission* of sound; therefore, to be consistent in support of the corpuscular theory the analogies must relate to the *transmission of corpuscles* in the production of the sensations of taste, touch and smell. Is there any analogy between these three senses in this respect? Does an object transmit corpuscles to excite the sensation of feeling"? &c.

The above is almost inexcusable, if we did not consider its source. The analogy has nothing to do with the "method of transmission" as just stated, but relates alone to the simple fact of substantial contact of the thing *sensed* in the three cases respectively. Of course we were hardly so shallow as to assert that there is the slightest analogy existing between the "method of transmission" in the case of *sound* and that of *light*, when the former is obliged to have a conducting medium while the latter travels without one! There is thus not the remotest analogy in their manner of transmission; yet we claim that there is a beautiful and harmonious analogy in the fact of their substantial contact with the sense organ in both cases. So also is the fact of corpuscular contact in the case of substantial odorous particles and substantial sound-pulses equally analogous, while there is very little resemblance in the method of their transmission from a distance except in the fact that they both have to travel by a conducting medium. The trouble with Prof. Cather is, that he lacks the philosophical acumen and the analytical resources to grasp the true application or scope of an analogy or simile. He makes points of comparison where none are intended, and rejects the

most beautiful analogies because they do not apply indiscriminately in all directions. In his misapprehension of the very idea of analogy and the rules for its application, he asks the most childish and silly questions about points entirely irrelevant to the case in hand, and then chuckles in glee over the want of analogy that his own ignorance of the case has conjured up. For example, because the sensation of *smell* is produced by particles of the odorous body conveyed through the air to the nose, he asks substantially but triumphantly if we hear a bell by the contact of its metallic particles with the tympanic membrane? Or if we see a man at a distance by his material corpuscles shooting through the air and entering our eye? If not, where, he asks, is there the boasted analogy between the senses? We are really sorry there is not a more liberal supply of brains in the *Indicator* office. If there had been, the editor might easily have seen that the substantial but incorporeal light-particles, reflected from the man's person and clothing in quantities and colors corresponding to the form and shading of the man impress his image upon the retina of the observer by actual contact, and thus convey to the mind the fact of the man's real form and appearance even at a distance. In an analogous manner the substantial but incorporeal sound-corpuscles from the bell (not its metallic particles) make the substantial impression upon the auditory membrane by actual contact, thus conveying to the brain and mind the character of the instrument making the tone as well as the pitch and intensity of the sound.

Possibly Prof. Cather's utter incapability of grasping the nature of an analogy cannot be better impressed upon his own brain than to turn the tables upon him by an application of his peculiar style of logic. He says that the sound of a bell at a distance is conveyed to the ear by the "tremulous vibrations" of the air, the same medium that conveys light to the eye. Now will the Professor kindly indicate if he sees a man at a distance by the said man quivering and thus sending off a "tremulous vibration" of the intervening atmospheric "infinitesimals" which enter the eye, thus causing a tremor of the retina and optic nerve corresponding to the tremor of the bell and the tremor which sound produces in the tympanic membrane? We dislike to slap back in this way, but some men cannot take a scientific hint unless accompanied by a philosophical kick.

We are thus prepared to sum up this whole matter of the analogy of the five senses in such manner as to illustrate the harmonious beauties of Nature's laws better than we could have done but for Prof. Cather's frivolous attack, and thus vindicate anew the grandeur and symmetrical proportions of Substantialism. The beauty of the analogy which we so elaborately discussed and illustrated at the close of the fifth chapter of the "*Problem*" consists as much in the fact of an entire want of similarity between the highest and lowest of the senses and the methods of transmitting the sense-producing substance, as in the perfect analogy that exists in the fact of actual substantial contact being necessary in producing each of the five sensations. The beauty in the first case consists in the natural gradations from the lowest sense, that of touch, all the way up to the highest, that of sight, and no two of them alike. 1. In touch or the tactile sense the body felt may be solid, liquid or gaseous. It may be material or incorporeal, such as the pressure of a piece of wood or the radiating rays of heat; but in every case, or modification of it, actual substantial contact is necessary. And right

here the very fact that heat produces taction, which is felt as distinctly as the contact of a spray of water, proves heat to be substance and not a mere mode of motion.

2. In taste we have also its application extending to solids, liquids and gases. But here appears a characteristic not experienced in the mere tactile sense and which lifts taste above touch, namely, that of *diffusiveness*; the flavor of sugar for example spreading over the entire gustatory membrane, thus raising it a grade higher than mere touch and approaching that of smell. Yet no object was ever tasted unless by the actual contact of the substantial flavor-particles with some portion of that organ.

3. In the sense of smell, the next higher and finer grade of sensation is reached. Here the odorous particles separate entirely from the odorous body at a distance, travel by diffusion through the air, and reach the olfactory nerve in the most refined and attenuated condition known to material substance. Here the next step in the gradation of refinement above taste takes place. Here a distinct break occurs in the analogy between taste and smell as regards the method of transmission while keeping true to Nature's unity of plan and the foundation principle of the substantial philosophy, that there must be an actual contact of the odorous substance with the sense membrane to cause the sensation, the same as in taste and touch. And here we wish to emphasize the beautiful fact that this connecting link of substance (odor), exactly midway between the material and the incorporeal realms of Nature—a substance that can neither be weighed, collected, measured, observed by any other of the senses, nor subjected to any mechanical or chemical test, so near is it upon the border-land of immateriality—is also exactly midway among the five senses; the two below being susceptible of sense-impressions by gross material contact, while the two above being only influenced by the most intangible of immaterial substances. This regular gradation of diversity as we pass upward is as much in keeping with the harmonious order and beauty of Nature as is the uniformity of actual substantial contact which we claim to be necessary in the production of every sensation.

4. The sense of hearing in this rising gradation, one step above that of smell, still keeps up the harmony of Nature's uniform plan, producing the sensation by the actual contact of substantial sound-corpuscles as the sensation of smell is caused by the substantial contact of "odoriferous particles" as Prof. Tyndall expressly states it. But here at the sense of hearing is a great step in advance of that of smell. While odor, on the very borderland of materiality, is almost incorporeal, sound is entirely so. While odor travels by a law of diffusion through the still air very slowly and for only a short distance, sound travels with hundreds of times its velocity and hundreds of times as far. And while odor will travel through no solid or liquid body, sound travels through all bodies—solid, liquid or gaseous. How great the leap in this upward gradation, yet how uniform the mode of producing the sensation—namely, by the actual contact with the sense organ by substantial corpuscles!

5. Last and above all we come to light, and the sense of seeing. Here, a field is opened up to observation which vastly outstrips those of all the other senses combined, and which surpasses in refinement almost the powers of human conception. Light travels incomprehensibly swifter than sound, yet without any conducting medium what-

ever, and by a law of radiation and transmission, known only to the Author of Nature. Yet that it is a *something*, a positive *entity*, and not the mere wave-motion of an imaginary entitative medium (*ether*), is so rational that it appeals for confirmation to the intelligence of every untraveled mind. Hence it must be an incorporeal substance. In the name of reason, why should it not be a real substance, imponderable and beyond mechanical test, as well as the *ether* which is its supposed medium of propagation, and which no eye sees, ear hears, nor tactile nerve feels? Light as an entity does appeal for proof of its real existence to one of our senses, while *ether*, believed in as substance by the whole scientific world, appeals to no sense—not even to *common-sense*—and can be shown to exist by no possible experiment. Even Prof. Cather, despite his proclivity to jumble things, possessed enough intuitive rationality to discard the supposition of *ether* as but the substitution of one immaterial, imponderable substance, that we know nothing about, for another (light) which we do know to exist by at least one of our senses. But after thus honoring his intellect he spoils it all and forever disgraces that same intellect by actually supposing and teaching that light is but a refined mode of motion and travels by the *tremulous vibrations of the air*, as already quoted, the same as he had supposed sound to travel from the bell to the ear!

Our ground thus sustained, that light is an incorporeal substance, completes the harmonious chain of analogy existing between all the senses, and linking them indissolubly as to the substantial contact by which sensation in every case is produced. And while our chief claim of analogy, upon which Substantialism rests, is thus sustained it leaves an entire want of analogy in the mode of transmission of the different substances thus *sensed*, at the same time it exhibits a beautiful gradation in refinement from the gross material body touched and felt up to the incorporeal light-rays transmitted at nearly 200,000 miles in a second, and which still produce the sensation of sight by actual contact at such enormous velocity without injury to the delicate organs of vision. How marvelously wonderful, yet how transcendently beautiful!

In thus dismissing Prof. Cather forever (as we expect not to refer to him again till he indicates some little correct knowledge of scientific matters), we beg the reader's pardon for using so much of our valuable space. But as intimated at the start, even his disjointed criticisms, contradictory as they are, have fortunately called out points in defense of Substantialism that might otherwise not have been placed on record.

IMPORTANT INQUIRY.

WILFORD HALL, PH. D. :

Dear Sir—How do you harmonize your views of sound with the known effects of atmospheric conditions upon sound-transmission? For example, it is well-known that sound travels better, and is heard farther as a general rule when the air is damp than when dry and clear. It is also heard farther, as a rule, with the wind than against it. Do these facts conflict with the substantial theory?

Yours very truly,

C. H. JOHN.

BROOKFIELD, MO.

REPLY TO THE FOREGOING.

The acoustical facts named by Prof. John, and other analogous facts we could specify, are entirely

in keeping with the corpuscular view of sound-generation and transmission. Pure water is known to be a four-fold better conductor of sound than dry air; hence the more aqueous vapor there is distributed through the air, extending evenly from the sounding instrument to the listener, the plainer and farther will a sound be heard. Of course this does not apply to a rain shower in which the conducting medium consists of two substances, air and water, in separate and distinct divisions, as when drops of water are intersticed by air. It is well-known that this condition involves two distinct mediums and causes the constant interruption of sound by changing from one to the other, which is a great hindrance to sound-propagation. It is only when the water in the air is infinitesimally comminuted that it constitutes the two but one medium, and thus improves its conductive quality, just as substantial currents of electricity will travel with greater facility through some conducting substances than through others. If sound, on the other hand, were only the wave-motion of the conducting medium, depending on its elasticity for the "condensations and rarefactions" which are said to constitute sound-waves, it ought by all means to travel better through pure air—one of the most elastic bodies known—than through water, which is almost entirely inelastic, being almost wholly incompressible, and which conducts waves, not by elasticity at all, but entirely by the action of gravity in pulling down any water that may be displaced. Hence an atmosphere filled with moisture ought to be more difficult to throw into waves of "condensation and rarefaction" than one of pure air, and consequently ought to be a poorer medium for transmitting sound. This is but common sense.

The reason why sound travels, as a rule, better with the wind than against it, would seem quite obvious from the foregoing. We made this very plain in the *Problem of Human Life*, at page 266 and onward. If sound travels at a certain velocity through a given conducting medium, and then the medium itself also travels with a certain velocity in the same direction (as does the body of air in the case of a wind), it ought to be plain to any one that the sound under such circumstances will travel just the added velocity of the wind faster than in still air, all other conditions being equal. In traveling against the wind, of course this wind velocity would have to be subtracted from the normal velocity of sound in still air having the same conductive condition. It is exactly the same as if a wire while conducting electricity should itself travel at a given speed in the same direction. That speed would, of course, add just that much to the normal velocity of the electric current through the wire. If sound on the other hand, were merely air-waves we are not able to conceive how it could travel at all against even a moderate gale. Nay, more,—and here we meet the radical difficulty lying in the way of the current theory,—we can not imagine how it is possible for a slowly moving prong or string to send off air-waves at all at the velocity of sound through still air, or even with the wind. Or if a prong will really send off such condensed-wave just 1,120 feet in a second, and no more, when vibrating at its greatest amplitude, we fail to see how the same condensed-wave is projected at exactly the same rate of speed when the same prong is vibrating with only the *one millionth* of its maximum velocity, and consequently exerting but the *one-millionth* as much mechanical force upon the air in order to compress it. Yet, we know positively

that such prong sounds audibly in both cases, as was so clearly demonstrated last month in our reply to Prof. Stahr. Of course, the sound-pulses in either case must travel at the same rate of velocity, 1,120 feet in a second, as all physicists agree. Possibly Prof. Mayer, the great American physicist at the Stevens' Institute, Hoboken, N. J., would be able to explain such a trifling difficulty, and would be willing to do so if urged by letters from the students and Professors of other colleges. If he can be so induced, the columns of *THE MICROCOSM* are open to him at any time, and our readers will all, no doubt, be delighted to see him undertake the task.

FOR THE INDEPENDENT EDITOR TO READ.

Rev. Dr. V. S. Stinnen, of Ennis, Tex., writes us:

"Your readers here are all pleased with *THE MICROCOSM*, and more so to see that your views are continually gaining favor with thinking men. A few months ago Dr. Chalmers, of Cal., paid a visit to a relation here—Mr. T. B. Chalmers—who is a subscriber and admirer of *THE MICROCOSM*, which he soon put into the hands of his distinguished relative. The Dr. had been for years an admirer of Darwinian Evolution. He read *THE MICROCOSM* from day to day, and finally told his cousin he would like to have a copy of the *Problem of Human Life*. Mr. Chalmers knew I owned a copy, and asked me to loan it to the Doctor which I did; and in a few days the Doctor called to see if I would sell it to him, which I also did. Mr. Chalmers told me that a few days later the Doctor approached him with the "*Problem*" in his hand, and with tears in his eyes, saying, 'I would not take one thousand dollars for this book and be without it.' May God abundantly bless you in redeeming the truth from the fallacy of Darwinian Evolution."

Rev. Dr. R. L. Abernethy, President of Rutherford College, N. C., writes:

"I am deeply interested in *THE MICROCOSM*. I regard it as the best periodical of the day. I shall work for it, whenever I go abroad. Work on! Your reward is sure. God bless you and yours."

Prof. Thomas Munnell, A. M., Mt. Sterling, Ky., writes:—

"Substantialism bears acquaintance. It bridges a chasm between the seen and the unseen, *never before constructed by science and philosophy*. Thousands are your debtors."

A. C. Williams, M. D., Hugo, Ill., writes us:—

"I never took a paper or magazine before, that I read everything in it till I got *THE MICROCOSM*."

THAT BRICK-ILLUSTRATION.

Rev. W. B. Berry, Napa City, Cal., makes a telling point against Prof. Carhart's brick-illustration as quoted by us in the August *MICROCOSM* in our reply to that professor. If the action of "elasticity" of the air, in shaking four cubic miles after the locust starts it, is the same as the action of gravity in toppling over a row of poised bricks after the first one is pushed against the next, as Carhart insists, then Mr. Berry justly claims that the air should continue to shake and the locust be heard entirely around the earth with the same intensity as near the insect, because gravity would pull down the last brick with precisely the same force as the first one, if the row of bricks extended entirely around the earth! Score one point for

Berry. Poor Carhart! We hear nothing more from him or the North Western University since his locust explanation was analyzed. Guess he was satisfied. If not, let him grapple with our "demonstration" in the October MICROCOSM in our reply to Prof. Stahr, on the slow motion of a tuning-fork's prong while the instrument is yet sounding audibly. We have sent him that number, so he can see how it is himself.

INTERFERENCE OF LIGHT.

UNIVERSITY OF ALABAMA, }
Sept. 25, 1883. }

MR. HALL:—Please give me your explanation of the phenomenon often observed over the roofs of houses, and many other places, on a warm, bright day—a kind of flickering in the light or atmosphere, commonly attributed to what some physicists term "Light-Interference," and you will greatly oblige a constant reader of THE MICROCOSM. Very truly yours,

Cadet E. M. HARRIS.

REPLY TO THE FOREGOING

Air, proper, cannot be seen either at rest or in motion, neither can heat. Hence what is seen rippling up from a heated roof is the aqueous vapor through whose ripples the rays of light are irregularly refracted or bent, and then straightened as the rising vapor is irregularly dense or rare. This causes the wavey, gossamer effect as if spiders' webs were being fluttered in a gentle breeze. A beam of light may be refracted or bent away from the eye by passing through a dense medium at a certain angle and thus cause its absence to appear darkness. Or a beam may be divided by striking the angle of a prism in a certain way, and thus cause an absence of light (the equivalent of darkness) between the two prongs of the divided ray. But this is *not* interference. We deny that two lights were ever combined in any such way as to produce darkness, any more than two sounds can be so combined as to produce silence. We have abundantly shown in THE MICROCOSM and also in the *Problem of Human Life*, that the law of interference as relates to sound is a clear misapprehension of physicists. And as light interference is based upon the supposed wave-motion of ether deduced from the wave-motion of air in sound, hence the self-evident fallacy in both cases.

PROF. VAIL'S THEORY OF THE FLOOD.

We must confess that we are somewhat surprised and no little gratified on reading the ingenious and logical reasoning of Prof. Vail in favor of his theory of the annular system of the earth before the time of the flood, as printed elsewhere. We regard his conclusions upon the subject, if not positively established, at least so well sustained by proofs as to leave little doubt in a philosophical mind of the general correctness of his theory. One thing we feel sure of, that no reader will grudge the time it takes carefully to peruse and even study his series of articles on this subject. We have read every contribution that has appeared in this magazine,—many of them with intense pleasure,—but we are free to confess that the second paper in this number of THE MICROCOSM from Prof. Vail's pen has kept us awake as long in earnest meditation as any other paper we have had the honor and pleasure of printing.

ARTICLES CROWDED OVER.

We still are forced continually to let excellent communications pass over from number to number, and which we intend to print. We have already on hand more than enough papers of an excellent quality to fill another number of THE MICROCOSM. We will divide these up, and bring them in among our regular contributions as fast as we can. We cannot possibly get time to answer personally those who write us and send us good articles for this magazine, but we assure all such friends that their communications are none the less welcome and appreciated, and that they will be used as fast as room can be made for them in our crowded columns. We would be glad to enlarge THE MICROCOSM one half, or sixteen pages more, if we could; but it already costs more than we get for it, leaving not a dollar's profit at the end of the year. But we do not complain. The work is glorious, and pays in profound gratification what it lacks in money. If we are only spared and able to carry forward the work for many years to come we shall be abundantly satisfied if we never make a dollar on this earth.

WILL PROF. STAHR FOLLOW SUIT?

Prof. Jacob Chapman, A.M., of Exeter, N. H., formerly Professor of Mathematics, in Dartmouth College, and who held the same position for years in the Franklin College (now Franklin and Marshall, where Prof. Stahr holds forth), and who conscientiously believed in and taught the wave-theory of sound as laid down in the text-books, now writes us that he has abandoned that theory as entirely wrong by reading the *Problem of Human Life* and THE MICROCOSM. Will Prof. Stahr go and do likewise, and thus follow in the footsteps of his illustrious predecessor? His only hope of redeeming his reputation is evidently to come out now while it is yet time, and thus voluntarily confess that the old theory has broken down, before he is deserted by the thousands of Professors of physics who have not been foolishly tempted to commit themselves by attacking our impregnable position.

REV. T. WILLISTON'S ARTICLES.

Last month we announced the commencement of a series of papers from the pen of our able contributor, the Rev. Mr. Williston. Since that announcement we have had a pleasant visit from him, and by mutual agreement have postponed the first article of the series till next month. Mr. Williston came to the city to see about the publication of a book he has been writing for some years, the title of which he has not yet given us. Whatever its name may be, we venture to predict a high order of excellence in its subject matter, and an appreciative reception by those fond of profoundly thoughtful discussions of theological-philosophical questions.

THE "MERCERSBURG PHILOSOPHY."

We print elsewhere paper Number 1, on the above subject from the finished pen of our excellent contributor, Dr. Swander, to which we call the attention of our readers. If the second of these papers does not strike home to the very centre of theological gravity, and touch the quick of certain adherents of that Philosophy, then we do not comprehend the nature of home-thrusts.

WILFORD'S MICROCOSM.

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THE TRUE FOUNDATION FOR HUMAN CHARACTER.

BY PROF I. L. KEPHART, A.M.

From the earliest history of the race, the great need of man has been a proper foundation on which to build human character and rest securely human hopes for the hereafter. Nor has man been ignorant of this, his greatest need. As the race has moved down through the centuries, its wisest and its most careful observers have recognised this universal want and sought to supply it. The fact was apparent to them that man was not in possession of his greatest good, and that he did not make the most of his capabilities for usefulness and happiness. The great want has been, a proper model after which to fashion life, a perfect foundation on which to build a perfect character and on which to safely rest human hopes.

The patriarch of Uz recognised this great need of the race, and as readily acknowledged his inability to supply the want. (See Job 19 and 23 Chapters).

Confucius sought to supply the need; and many of his precepts are wholesome in their influence on society; but the civilization of China to-day is a most overwhelming and conclusive proof of their inefficiency and defectiveness as moral and social elevators of the race. Instead of their proving to be effective in giving to man a perfect character, and in placing him in possession of his greatest good, they have bound him in the prison-house of repulsive, disgusting, and degrading customs. Instead of developing his intellect and bettering his condition socially by inspiring thought and stimulating to high endeavor, they have converted him into a mere imitator who for more than three thousand years has but repeated the customs of his ancestors.

In India, Brahmanism was intended to supply the great need; but what is to be expected of a foundation for hope and noble endeavor the chief tenet in which is the declaration that, "existence is the chief evil to be dreaded?"

Buddhism, a reformed system of Brahmanism, sought to supply the want; but its crushing, blighting declaration that, "death is salvation," and "annihilation is heaven," has had the effect, as was to be expected (and as the present condition of the masses in India proves), of degrading the race and crushing out the intuitive, noble aspirations of the soul.

Mohammedanism was intended to supply the need; but its utter worthlessness, after a thousand years of trial, heralded forth by the licentious Turk and bloodthirsty, improvident Arab.

The New Philosophies of modern times have sought to supply the need, but virtually they have only succeeded in directing human thought back to some of the ancient schools of Materialism and Pantheism, or in leading it out into the weary and unsatisfactory wastes of a soul-be-

numbing Agnosticism. Some, by means of a positive philosophy, some by means of intellectual development, and some by means of literary and æsthetic culture, claiming that man can be placed in possession of all that his highest nature can enjoy and all that his soul can desire.

But their utter worthlessness as foundations on which to build character and rest human hopes for eternity was demonstrated as early as the days of Socrates and Plato. Instead of carrying Greece and Rome up to the highest pinnacle of human goodness and happiness, these nations, favored with all that philosophy and culture could bestow, relapsed into the depths of social and moral pollution and perished of their own vices.

But, "in the fulness of time," Jesus the Christ, the model man described by Plato, the perfect teacher whose coming was predicted by Socrates, came and laid a perfect foundation for human character and human hopes. Its essentials are clearly set forth in the Sermon on the Mount, and in the history of His life. He revealed the Father and taught man how to worship Him in the spirit as well as in the letter. By His exemplary, perfect life, He taught man how to build up a perfect, God-like character, and by His words and His death He exemplified the transcendent beauty of unselfish devotion to truth and right. In His Gospel man finds the complete remedy for both the guilt and the love of sin, the finding and accepting of which inspire him with a newness of life in Christ Jesus; and being thus inspired, he finds it to be a pleasure, and comparatively easy, to build upon this foundation a character redolent of righteousness, holiness and philanthropy. Having been lifted up to this plane of higher motive, the soul no longer grovels in slavery to carnal things—no longer is in bondage to the fear of death. This life becomes to him a grand theater of action, because it is the ante-chamber in which the soul lays off the old rags of a depraved mortality and daily robes itself in the garments of Christ's righteousness and salvation. To him every act is momentous, every moment is important, for they are all moving him up nearer to that grand and glorious mansion in which he is soon to dwell in perfection at God's right hand.

This foundation, this system meets all the requirements of man's nature; hence it is perfect. It blesses him and his race with the most precious and lofty aspirations. It completely satisfies all the longings of his soul. It frees him from the guilt of sin, and from the love of sin; hence, it is a perfect system—a complete foundation, meeting all the wants of all classes and conditions of mankind.

Its completeness is verified by the very satisfactory results of a test of eighteen hundred years. Wherever it has gone, it has blessed the world. The Republics of Greece and Rome were destroyed by an aggressive Epicurianism, and an imbecile Cultureism; but Christianity is

now rebuilding those once famous but ruined empires. It has lifted Northern Europe from savagery and a besotting Paganism, and placed it in possession of many of the blessings of an advanced Christian civilization. America it has dotted with the colleges and philanthropic institutions of an enlightened, free and happy people; and from Europe and America its missionaries are going forth into all quarters of the globe, lifting men and women into this higher life of hope and usefulness. It is God's antidote for the world's moral and social ills.

**SIN NOT AN UNLOOKED-FOR INTRUDER,
BUT EMBRACED IN THE CREATOR'S
"ETERNAL PURPOSE."**

BY REV. T. WILLISTON, M. A.

How came that loathsome and almost ubiquitous thing called sin to have any existence? is a question that has long and laboriously been studied, as well as variously answered. The Persian Magi, and after them the Manichees, deeming it irrational to suppose that a good Being could have any use for evil, or be its originator, maintained that there were two gods, one the producer of all good things, and the other the author of all that is evil. Without wasting any time on this mode of accounting for the origin of sin and its consequences, what say we whom the Bible has enlightened? Here are two propositions, to one or the other of which logic will compel us to yield our assent: (1.) In entering on His creative work, and when ushering angels and men into being, God did not anticipate the existence of sin, nor devise any remedy for the evil in case it should ever exist. He knew indeed that angels and men were capable of sinning, but He either did not or could not know that they surely would sin. To Him, therefore, sin was an unlooked for intruder, an unexpected defacer of the moral system He had established; and He now had to set about instituting some remedial scheme, some mode of repairing the injury He had not anticipated or made provision for. (2.) Before giving existence to rational agents or to a moral system, the Creator not only foresaw all the sin that was ever to exist, together with all its fearful results, but, conscious of His ability to utilize the evil and make it productive of the highest ultimate good, He embraced it and the great remedial scheme of Atonement in "the eternal purpose which He purposed in Christ Jesus our Lord." (See Eph. iii:10, 11.) In fewer words it is either true that God created free agents, ignorant of what their character and doings would be, and without expecting the ingress of sin, or that He was fully aware, before creating them, just how each agent would conduct, and that for wise reasons He deliberately chose to let sin constitute a factor in the moral system.

To me the first of these propositions so belittles the Omniscient One, and on its very face appears so irreverent and irrational, that I marvel how any reverer of God and the Bible can credit it for a moment. As applied to the Divine Being I deem the word *nescience* utter-

ly inappropriate not only, but extremely irreverent. As applied to Him of whom it is said that "His understanding is infinite," that He "knoweth all things," and even "searcheth all hearts," the word *nescience* is equivalent to saying that God is, after all, *partially ignorant*; and I should deem it profane to ascribe any ignorance whatever to Him whom I revere. If, to save God's character from what they deem a reproach, any of my brethren can intelligently and reverentially accept the "Divine Nescience" theory, I must be excused for parting company with them, and endeavoring to show the truth of my second proposition.

If my article on the Foreknowledge of God, in the June number of THE MICROCOSM, has failed to convince its readers that sin, so far from being unlooked for by the Creator, was foreseen by Him in all its vast prevalence and its appalling consequences, I shall here present no additional proofs of a truth which the Bible so fully maintains, and which reason itself confirms. I will, however, quote a passage or two more of Scripture—Eph. iii:10, 11, and 1st Pet. i:20, were cited in my June article—to prove that with God the Atonement was no afterthought, no scheme devised to repair an unexpected disaster, but an eternal device of the Creator to meet the exigencies of man's anticipated apostasy. Of saints, Paul speaks (Eph. i:4,) as having been by God "chosen in Him (Jesus) before the foundation of the world;" and in 2 Tim. i:9, he speaks of saving "grace, which was given us in Christ Jesus before the world began." Now if the saved were "chosen in Christ before the foundation of the world," or if, in the purpose of God, "grace was given the saved in Christ Jesus before the world began," is it not a legitimate inference that, "before the world began," God beheld sin as if an existing fact, and had both it and its antidote in full view? And is not this confirmed by what is said of some, (Rev. xvii:8,) "Whose names were not written in the book of life from the foundation of the world?"

Admitting, then, as it seems to me we must, that in the mind of God the awful ravages of sin were fully anticipated, and that "before the foundation of the world" Jesus "was fore-ordained" as the Saviour of sinners, must we not also admit that, for some wise and benevolent reason, God chose to let that odious thing exist which He abominates? If it be true, as some would have us believe, that sin could not be so utilized as to issue in the highest possible good, or that God could not choose to have sin exist with a holy motive, or without becoming sin's author and approver, and if true that, had it been possible, He would have prevented sin from having any existence, how account for the fact that He did not relinquish His creating enterprise, and refrain from bringing creatures into being that He knew would sin? None will deny that He could have thus refrained, and *that*, surely, would have effectually prevented sin's existence. Reader, does not the fact that, with sin and its consequences in full view, He proceeded to create, convince you that the All Wise One embraced sin in His "eternal purpose" because He saw that, loathsome as it is, in its own nature, He could make it promote

His glory, and a higher ultimate good than could be secured without it? It being confessed that God must have foreseen all the sin and woe that would be the result of His creating work, what could have induced Him to create a system fraught with such consequences, if He did not see that with just such a system He could achieve a higher amount of good than with any other? If a greater amount of good, or even as much, could have been secured by a system that shut out all evil, it seems obvious that the Creator would have preferred it.

Just *how* the highest good could be effected by God's permitting sin to exist, we, the short-sighted creatures of yesterday, may not presume fully to comprehend. It is not for us to "find out the Almighty unto perfection," or fathom all the mysteries of His administration; for "how unsearchable are His judgments, and His ways past finding out." Yet I trust there will be no impropriety in our trying to see whether there be not some discernible utility in the sin-embracing system that God has chosen, some benefits for the production of which the existing system seemed necessary. Precisely why this system was deemed preferable, or what were the Creator's exact reasons for choosing it, we pretend not to know; but to form some conjectures on this point can do us no harm, and may prove beneficial.

Is it not one great law of our being, that good things are never so thoroughly valued, or keenly enjoyed as when they are placed in contrast with evil things? Are not all agreeable things rendered doubly agreeable when preceded by things distasteful? Can he that has never had an ache, or a pain, or a sick day, prize uninterrupted health, as he can that has been racked with intense pain, or prostrated with wasting disease? Does not the emancipated slave prize freedom far more keenly than if he had never been a bondman? What good thing is there that we do not better appreciate and enjoy, if we have first experienced the evil that is its direct opposite? Adversity greatly enhances the value of prosperity, and deformity serves to render beauty more beautiful. Hope is all the more exhilarating when it succeeds depressing fear, and so is joy when it comes after grief and sorrow. In the kingdoms of nature, and providence, we are everywhere presented with things that are the direct opposites of each other, and it is by means of such opposites that our discriminating powers are developed, and that we learn "to refuse the evil, and choose the good."

Now this utility of evil things is not limited to earthly objects and occurrences, but is plainly discernible in God's spiritual kingdom. Whatever may have been God's purpose in permitting moral opposites to exist, it may safely be affirmed that just as sickness and pain render health more precious, so the existence of sin gives added lustre and value to holiness; and all the vices that infest the world, become doubly odious when placed in contrast with their opposite virtues. It cannot be questioned, I think, that the sinless angels have a profounder sense of sin's odiousness and of the beauty of holiness, in consequence of the rebellion and expulsion from heaven of Satan and his confederates; nor can it be doubted that their love and loyalty have been thereby inten-

sified. It is doubtless true, also, that the pious of our race will forever love God and holiness more intensely than if they had never known what sin was. The love that purified and pardoned sinners have for God will forever be vastly stronger, and their adoration more profound, than Adam's would have been had he remained sinless; and the holiness of both the angels and the redeemed, will doubtless be far greater in amount than if sin had never existed.

But if sin has in the way just mentioned been utilized, how much more, in the rich and impressive display of Divine justice and mercy which it has been the means of calling forth? It seems to have been important that God should place before the world one great and memorable example of His punitive justice on the one hand, and of His recovering grace and pardoning mercy on the other. Judging from what has transpired, is it not safe to conclude that the highest ultimate good of the rational system demanded that display of mingled wrath and mercy that God has placed before us? While I dare not confidently affirm that sin was suffered to exist *for the very sake* of God's displaying these attributes of His, yet, so far as we can see, it was not only important that they should be displayed, but no opportunity for the display would have existed had the system been a sinless one. Had not Satan instigated a revolt in heaven and in Eden, it is obvious that the glorious scheme of Redemption—a scheme which the elect angels contemplate with wonder, and in which God's abhorrence of sin and His yearning compassion for sinners is so richly displayed—would never have been made to exist. Whether sin was allowed to exist for that purpose or not, it was the rebellion of angels and men that made room for a richer display of God's wisdom, rectitude, and goodness than could otherwise have been made.

Both sacred and profane history furnish numerous instances in which man's wickedness has been made by the great Disposer to result in immense good, and that, too, when the good could not, seemingly, have been secured in any other way. But the most illustrious example of this is found in the crucifixion of the blameless Son of God. It was only by "wicked hands," that He could be betrayed, condemned, and put to death; but O, what finite mind can measure the vast amount of good that God has effected, and is yet to effect, by Christ's dying a malefactor's death? Now the Bible makes it certain that His being wickedly put to death was a foreordained event, and that all the actors in that nefarious plot were doing the precise thing which God had "determined before to be done." To me, then, it is quite obvious that God embraced sin's existence in His "eternal purpose," not because He loved sin, or deemed it a good thing in itself, but solely because He saw that He could make a certain amount of it subserve a very valuable purpose, and be a means of effecting a higher amount of good, in the end, than could otherwise have been secured. And I am glad, for one, that the world's Sovereign can make the wrath of men and devils to praise Him, and that He knows how to utilize the very thing that His soul abominates.

In my next article I propose to *commence*

a refutation of the objections, urged by Dr. McCabe and others, against the unlimited foreknowledge of God.

DOES NATURE SUSTAIN THE EVOLUTION THEORY OF THE ORIGIN OF SPECIES?

BY ISAAC HOFFER, ESQ.

There are two prominent, distinct theories of the origin of life on the Earth. The one is that it was introduced by a Power superior to Nature, and the other is that it was originated by matter and the forces operating therein; but as the subject under discussion is only the origin of species, the question of the origin of life will only be considered so far as it will aid in elucidating that subject. The theory that species are only grades of organic life, which time, circumstances, and conditions have brought about and marked, is the one on which the testimony of Nature is to be heard and examined. What does Nature in her manifestations show to sustain or oppose that theory? Darwin, Huxley, and others, tell us that she shows a gradual development of organic life, from a lower to higher order—from the simplest to the most complex organization; that she shows a persistent divergence and variability in the production of living organisms; and that in all her variability, she maintains substantially a typical form of structure, and a general mode of action in the development and growth of plants and animals. This, I think, is a fair summary of the main points relied on to sustain the evolution theory of the origin of species. These points are not disputed. There is no necessity for hearing and examining the testimony of Nature on these points. It is even admitted that standing alone and being examined only from the basis of organic productions, they make out a strong case in favor of that theory. But when we come to examine the application of the fact of a gradual development in life and organization, we find that it is just as applicable to a special-creation theory as it is to the evolution theory, and that it is just as good testimony for one as for the other; and is, therefore, no evidence in favor of either. For it is a self-evident axiom that *any fact that is equally applicable to two disputed points, settles absolutely nothing in these points.*

Darwin, however, relies chiefly upon the variability in the organic productions of Nature to sustain the theory of evolution. He has brought together an immense array of facts to show the great number of varieties that may exist in a single species, and dwells at great length on the different varieties of pigeons, and shows the modifications that can be affected by domestication and change of conditions; and argues, not without plausibility, either, that if such modifications are possible, that new and distinct varieties can be produced and propagated, it would be but a rational conclusion that new and distinct *species* might be produced, if the proper conditions could be provided. To find these proper conditions, he goes back into the dark past—into the realms of obscurity—and allows the imagination to find those conditions in the recesses between the fossils and rocks of

past ages. It is a sign of weakness when the obscurity of past ages must be invoked to establish a fact in passing events of the present day. Why not produce artificially the proper conditions under which a pigeon can be modified into some bird or animal that is not a pigeon? There is hardly an imaginable condition in Nature, under which pigeons can be reared, that cannot be produced, on a small scale, artificially. As Darwin's long chapter on natural selection, and his chapter on survival of the fittest are mainly facts and arguments to prove the variability of organic production; and as this position is not disputed, and the *law of variation* fully admitted, there are no questions to discuss except as to the conclusions deduced from the operations under this law. Darwin contends that, under this law of variations, plants and animals can be modified and changed beyond the limits of their species; but in the large number of facts presented, and the evident exhaustive research that he must have made, he fails to show a single clear and well authenticated case of divergence beyond the line of its species. Just as conclusively as his array of facts proves the certainty of the law of variation, just so conclusively does the *failure* of his exhaustive research to discover a single case of transmutation of species prove the error of his conclusions.

With all his unquestioned ability, and his persistent and able efforts, he has utterly failed to produce a single instance of variability either in vegetable or animal life, that a naturalist could class as a new species. He has not only failed to sustain his evolution theory, but he has furnished the strongest possible negative evidence against it. In every case he has failed to discover the transmutator of species; and forgetting that *known facts of the present are better evidence than vague speculations on improbable possibilities of the past*, has finally transferred the whole plot from the *light of the present time, into the recesses of oblivion in the remotest ages of the past.*

A fundamental outlining of structure in the organization of plants and animals is just as good testimony to sustain the belief in special creation as it is to sustain the theory of unlimited variability. It is very good testimony to show that all the varied and countless numbers of organisms have one and the same source; but this showing proves nothing directly as to what, or where, that source is. That fundamental structural types should *remain the same* through all the varied organisms from the lowest to the highest, the simplest to the most complex, does not seem to be the right kind of testimony to sustain the theory of *variability*.

A general mode of action in the development and growth of plants and animals is certainly as good evidence for sameness as it is for variability in every view that can be taken.

Evolutionists in their efforts to show a simple and low origin of life in matter, have inadvertently shown that Nature manifests a persistent adherence to order and system in all her actions, and that no differentiation which can take place under the law of variation has ever passed the confines of her lines of systematic action. They have thus inadvertently demonstrated and

proven the existence of *the law of stability* and have shown that this law is as universal, as persistent, and even more powerful in the direction and control of the activities of Nature than the law of variation. All, or nearly all kinds of plants and animals have varieties and individual distinctions; but the records and history of the past, and the closest and most extended researches of the present have failed to furnish any unquestioned evidence that all the changes in food, in surrounding circumstances, and in conditions have ever been able to advance a single individual or any variety beyond the lines of their kind, or to depress them below those lines.

Among the one thousand millions of human beings now living upon the earth, there are no two individuals that cannot be distinguished from each other; and there are such well marked and widely different races, that there is apparently hardly any resemblance between some of them, and yet it requires no naturalist to determine that they all belong to the human species.

That naturalists should find it difficult and at times even impossible to define the line of distinction between the innumerable varieties and countless numbers of species of plants and animals, is no argument whatever that no such distinction exists. The wonder is that naturalists have been able to determine, in so many cases as they have done, the distinction between varieties and species, and between different species.

Prof. Huxley in his lectures on evolution, in this country a few years ago, dwelled at great length on the missing links in the chain of gradation in vital organism, and seemed to lay great stress upon the supply of those links. I cannot see why special creation should leave more, or any greater, gaps in filling the earth with living things than evolution should by evolving out of one or more of a lower order all the higher orders of organisms. Special creation can build up solidly from the foundation, just as well as evolution; and it seems to me that the efforts to prove a gradual connected development from the simplest forms of life to the highest and most complex, are useless; not only because they are equally applicable to different theories, and therefore prove nothing favorable to any particular one, but because they do not reach the gist of the question of the origin of species. They show nothing of the *character* of the organizing agents; they leave the *source* of these agents out of the question; the *cause* of variability and of systematic action is not touched; and of the organic process but little is explained. How shall we reach the source of organic life and unravel the mysteries that surround it? Human research has so far been unable to unfold and investigate the vital operations in Nature beyond a transmitted propagation; so that even the question whether life commenced in the seed or in the perfected plant or animal, is still unanswered. The question of spontaneous growth—vital organization without a germ—seems to be decided in the negative. Tyndall's extended experiments, and the investigations of the same subject by other scientists have conclusively demonstrated that

there is no life, or organizing power, in matter. If this position is correct, then there can be no origination of life in matter; and *life must have been introduced into matter*. How and in what manner it was thus introduced and brought into active operation in matter, is not even indicated by Nature in all her manifestations; we are, therefore, confined in our investigations to the interaction of vital force and matter, and the results of that interaction.

Matter being inert, without life or action of any kind, all the animate activities in Nature must be due to powers or forces that are *not matter*; for that which is *universally the same thing* (inert) *cannot of itself, at times, be something else*.

Vital force, therefore, must be the operating power, and matter the passive thing acted on or brought into action in all organic action. It must be the power that gives to plants and animals their distinctive forms, characteristics, and powers; for the material parts of plants and animals when life is gone, are precisely the same as similar matter in an inorganic state. The elementary constituents of organic and inorganic matter are the same. The calcium in a plant or animal is, in every particular, similar to the calcium in a rock. An *organism is therefore only a material representation of an immaterial life—a materialized life*. The model, the building or organizing power, the moving and acting energy in the organism, are all in the invisible, intangible, and immaterial life, and the matter is characterized and adjusted to this life, showing clearly that the *vital force is the substantial part, and the controlling power in the production, growth, and sustaining energy of every plant and of every animal*. These facts are so clearly manifested in all the activities of vegetable and animal life, and in their results, that they should not be seriously questioned. *These facts constitute the basis and foundation of the law of stability in Nature*.

Vital force in the germ of a plant or animal, is like a machine with its movements fixed, its powers limited, and its actions restricted to the production of the certain things for which it was made. In a machine constructed for the manufacture of a certain class of goods, the material supplied, and the manner of its supply may vary the goods in many particulars; but it will still be the *class of goods for the making of which the machine was constructed*.

The germs of plants and animals of certain species, or the plants and animals themselves in their powers of reproduction, are all machines for the production and reproduction of plants and animals of their kind, and no others. *For no germ can confer a higher degree of organism than it possesses; and no plant or animal can transmit a superior or different organizing agency than it contains; and no power can impart that which it does not possess*. Hence plants and animals that possess fundamental, or organic distinctions can impart *only those* distinctions to their offspring; and these distinctions cannot be changed if the records and history of organic life, and the researches of man into that

life, can be relied on, and if self-evident axioms are no illusion. Variation in material and surrounding conditions may and do modify organic productions to an apparently unlimited extent, but productions under the law of variation never modified or changed any *fundamental distinctions* in organic life; and if the researches of Darwin and other evolutionists can be relied on, even the mode of action, and the structural type, remain the same in all organic operations, and show no signs of change. Organic products may vary, but organizing life remains the same; hence the law of stability is founded on the unchanging system of organizing life, and the law of variation in the varying material and conditions under which organic products are produced. Material and conditions, however, are merely passive things, and dependent contingencies that possess no active energy, and can, therefore, not affect or change the *character* or *nature* of any organic force. They can only affect the *action* of such force in its operation in matter, and modify the results of those operations; but *the operating energy remains the same in all its powers and characteristics essential to maintain the organic distinction.*

The modified effect is often manifested in reproduction, to a certain extent; but if the modifying influences are withdrawn, a return to the normal type generally follows, and more rapidly than the change from it. The modified pigeons, or any improved plants or animals will soon degenerate into the common type, if left to themselves in a wild state. Cultivators and stock raisers are only too well aware of the difficulty to maintain a cultivated and improved state in plants and animals; and the experience of these men is directly the reverse of the theory that a "struggle for existence," promotes physical development, and organic improvement; and that "the survival of the fittest" in such struggles should become the progenitors of an improved variety or a new and advanced species. These men's experience is that want of care and attention, and allowing plants and animals to struggle for existence, have a tendency to dwarf and degenerate instead of improve and elevate. That even the "fittest," in a struggle for existence where all suffer, are degraded below the average of those that receive proper care. The fact is, that plants and animals can just as well be degenerated and retrograded as improved and elevated; but, as has already been shown, the deviations from the common type of any species can never go beyond the fundamental distinctions of that type, either in an upward or downward direction.

Organic life is as immutable under the law of stability, as materials are different and conditions changeable under the law of variation; and yet there is no conflict under these two apparently opposite laws, for the plain reason that the acting energy in all organisms is the vital force, and not the material that enters into the organisms, or the conditions under which they are produced. This view furnishes the basis for a rational and consistent explanation of many of the operations and their results in organic life. It shows something of the characteristics of organic agents, and their

actions in matter, and assigns a cause for the stability in species and variability in individuals; and although it leaves the question of the origin of species unanswered, it clearly indicates that the theory of evolution cannot be sustained by the facts and laws of Nature. And as all the researches of Darwin, Huxley, Hæckel, Freke and others have failed to discover a single well-defined case of transmutation of species; and as all their extended knowledge and ingenuity have been insufficient even to suggest a possible combination of materials and variety of conditions that would modify plants and animals beyond the limits of their kind, the decision of this inquiry is, that all the testimony of Nature that has yet been offered is insufficient to establish or sustain the evolution theory of the origin of species; and that as long as *the immutability of species remains the universal and unexceptional fact, the law of stability, the supreme law in organic life, and no power in Nature can impart that which it does not possess, so long shall this decision stand.* ISAAC HOFFER.

LEBANON, PA.

THE MERCERSBURG PHILOSOPHY.—No. II.

BY REV. J. I. SWANDER, A. M.

Passing over, therefore, into the proper sphere of Christological science, Mercersburg Philosophy holds the Incarnation to be the central and controlling *fact* of all history; the key to the world's meaning; and the only light in which its chapters can be read without a bewildering perplexity. It represents the incarnation as having brought into humanity, and into the life of the world, an abiding substance which was not thus present before the advent of the Son of God. The union of God and man in the person of Immanuel is a fact of universal force for the life of the race as a whole, even though it be possible that some men may not be savingly benefitted thereby. The direct object or purpose of the incarnation, soteriologically considered, is the reorganization of the human family as necessitated by the foreign power or adventitious element of sin. Whether the incarnation would have taken place, though under different conditions, if sin had not entered the world, is a question upon which the disciples of Mercersburg are not yet agreed. It is highly probable, however, that a further and fairly logical development of the Mercersburg principle will ultimately return an affirmative answer to the above question, and that the conclusion thus reached will stand justified before the bar of latter-day exegesis.

The Mercersburg School of Philosophy teaches that the incarnation—the great central "mystery of godliness"—was no transcendent theophany coming down upon the race, touching its horizon at Bethlehem, and passing up again at Olivet, beyond the sight of the gazing Galileans, but a fact of perpetual force in the life and history of the world. The central channel of its onflow is the Church, which, under this view, is vastly more than the sum total of all Christians. The scriptural and truly philosophical idea of the Church implies, and

in its realization involves, not only members, but also functions organically operative by virtue of their vital relation to a common source and centre—Jesus Christ—who thus constitutes and continues this supernatural organism in the world as the mystical body and “fullness (complement) of Him who filleth all in all.”

Touching the point of relation between Christ and the individual Christian, the theology of the Mercersburg School is neither cowardly disposed nor logically able to avoid the following conclusions:—1. The Church stands between Christ and the individual believer, not in the way of mediatrix as Rome teaches, but “as the body of a living man is between any one of his limbs and the living soul by which it is quickened and moved.” 2. The Church as the “bride” and “Lamb’s wife” is also the mother, of whom Christians are born and by whom they are nourished. To nourish the children of the bride-chamber, the Church, by virtue of her spiritual union with the bridegroom, carries in her constitution that “fullness” of which each legitimate child receives “grace for grace.”

It follows further that Christianity is not mere precept, doctrine, nor morality; neither all of these combined. It is *Life*, and as such it develops itself according to “the law of the Spirit of life in Christ Jesus.” It rides in the chariot of precept, formulates itself into doctrinal theories, and blooms into the beauty of genuine morality. It does not pass into the sphere of Ethics as an outward proclamation of abstract authority, but legislates itself, through the freedom of the will, into the sanctuary of the soul, enthrones itself in the centre of human personality, and thus becomes the very substance of things hoped for, and the evidence of things not seen. The God-consciousness in man becomes the Christ-consciousness in the Christian—regenerated reason—*faith*. Starting thus with the fundamental principle of Schleiermacher, that Christianity is life, Mercersburg theology leads logically forward to the conclusion that religion in the substantial soul of an individual is neither mere quality nor quantity, but *substance*, of which both qualities and properties are properly predicable.

In short, Mercersburg Philosophy teaches a moderate Realism as over against Nominalism. With proper qualifications *Realism*, or what Dr. Hall sees fit to denominate *Substantialism*, is the battle-ground that truth has chosen for the coming conflict with the false theories of idealism, nominalism and phenomenalism on the one hand, and modern materialism with its molecular accompaniments upon the other. In this great battle of the near future, Mercersburg Philosophy and Substantialism will be found fighting side by side, against a common enemy. They are already moving their battalions on converging lines. There should be no strife between *The Reformed Quarterly*, 907 Arch street, Philadelphia, and *THE MICROCOSM*, 23 Park Row, New York City. They should be companions in tribulation, even as they are destined to become co-heirs in scientific glory. Mercersburg Philosophy is Substantialism walking on stilts, while “Substantialism” is a more recent announcement of the truth in the sphere

of physics, and a demonstration of its ability to run without stilts.

The ablest and most conservative advocate of Mercersburg Philosophy, in compliance with our request that he point out the ground-principles and leading features of that system, has written that “one of its chief points is its view of an objective, real and spiritual world, or sphere of being, from which the phenomenal world has its source, and by which it is constantly upheld. Truth is an objective spiritual essence, as are also the beautiful and the good.” Good! “Truth is an essence!” The sentence contains the very essence of truth. This is nothing short of Substantialism in the “real and spiritual world, or sphere of being;” and yet when Dr. Hall proclaims and proves, as an essential correlative in science, that sound is a substance, a certain apostle of Mercersburg Philosophy gets himself astride of an editorial waste-basket, and charges the most vigorous thinker of the century with being an “ignoramus,” a “sciolist” and a “charlatan.” Fifteen centuries of Christendom have proclaimed to the world, and upon bended knees at the holy communion, in the language of the Nicene Creed, confessed before high heaven that Jesus Christ is “God of God, and of one *substance* with the Father;” and yet, when A. Wilford Hall through his matchless reasoning reaches the same conclusion in science, and proclaims the same God as holding His being in veritable substance, all the little dogs in the kennel of ecclesiastic scholasticism begin to bark at his heels. He is charged with being a “materialist” and a “pantheist.” Splendid orthodoxy in the Creed becomes heresy, when published in the latest formularies of regenerated science. The sexton of the church will please turn on a little more light that the true character of such consistency may be made apparent before the world.

In concluding this paper the writer wishes to say to his worthy friends of the Mercersburg School, who have manifested such kindly anxiety concerning his relation to the recent departure in science, that for the present he has no intention of sundering his old orthodox moorings with a view of setting sail for the Spinozaen port. For all who have the brains to understand its teachings, and courage to follow its logical leadings, Mercersburg Philosophy is a safe pilot upon the swelling current of modern thought. It long since led the writer away from the wave-theory of the Gospel to embrace and advocate something more substantial in that “objective, real and spiritual world, or sphere of being, from which the phenomenal world has its source.” In full appreciation of the benefit thus derived, he wishes to see others who have also professedly abandoned the undulatory doctrine of salvation by subjectivism, consistent enough to throw aside that correlative nonsense and corresponding absurdity spoken of, in the dark ages of science, as the wave-theory of sound. Come, brethren, of “like precious faith,” step up to the rock of *Substantialism*, and let your souls delight themselves in feasting upon the fodder of your own Philosophy.

FREMONT, OHIO.

WEIGHTS AND MEASURES.

BY PROF. EDWIN R. GRAHAM, A. M.

In our former article we condensed within very brief limits an argument against the metric system of weights and measures. We read the reply of Prof. Wilhelm in the *Microcosm* with mingled feelings of satisfaction and surprise; satisfaction that our argument thus far remains intact—surprised that something like an argument for the metric system, or against the English one, was not produced. On reading the heading, "The Metric System," we expected to obtain much mental illumination as to its proverbial beauty and its practical advantages. From various points of observation, we subjected the article to telescopic and microscopic examination. Horizontally, perpendicularly, and diagonally, we traversed its entire area, and at last we retired despairing from our search, baffled in our attempt to discover some connection, however remote, between the subject matter and the heading. It was simply an uncomplimentary opinion of our "method" of reasoning, without the slightest attempt to defend the system from our criticism. We are not reduced to a similar strait by the necessity of our case. We shall not stop to deplore Prof. Wilhelm's poverty of logic, nor to admire his generosity of epithet. We shall proceed at once to the solitary point he endeavors to make against us. He says:

"His method is to take an integral number of units of the old tables, as thirty-two miles, and convert them into their equivalent in the metric system, and then because the units of the one system are not commensurable with those of the other, array the string of decimals resulting from the process as evidence of the cumbersomeness of the metric system."

Few of our readers, perhaps, had their attention directed exclusively to the decimals. They were used to show the inexpediency of a change of measures and weights, and as evidence of the inadequacy of metric units to express values *already established*. The English system is established, and to exchange it for any other system with an incommensurable unit would result in disastrous confusion. It was the duty of Prof. Wilhelm to show that this view is erroneous. He says, "The reasoning is just as good for the new as for the old system." This is a surprising statement, for the new system is not *in vogue*. If it were, the argument would be valid. Should we propose to substitute English weights and measures for those of Denmark, Spain or Portugal, the people of those countries might reply, "our weights and measures are established; to introduce English units will lead to confusion." We could not deny the soundness of the reasoning. We cannot admit so much to Prof. Wilhelm. If the page of a book is seven inches by five inches in area, it profits nothing to ask "how comes it?" If streets and roads are sixty feet wide, or if two towns are twenty-two miles apart, it is not argument to inquire, "how comes it?" They *are* so; and to express these dimensions in French units requires the use of numbers difficult for common people either to remember

or comprehend—especially when expressed in a jumble of Latin, French and Greek. The Committee on Coins, Measures and Weights, of the University Convocation of New York, declared that in order to introduce the system, its use must be made compulsory; and pointed to the fact that the opposition to it in France was so bitter, that to accomplish the introduction of the metric system, the use of any other system was made a penal offense. If the same law were passed in this country the effect on the mechanic arts, on manufacturing, on values and prices, and on our language itself, would be shocking. When we change the unit of measure and the scale of numbers, we necessarily change the *things themselves*. Under the new system all the short, sharp and crisp Saxon words which are now a part of our daily conversation would entirely disappear from our vocabulary. Three-eighths inch boiler iron could no longer be made; iron makers would be subjected to punishment for rolling out inch bar iron. Mechanics would no longer know the dimensions of their tools; and we could not construct the parts and pieces, in the old measures necessary to supply the worn and broken parts in buildings and machinery. The Scovill Manufacturing Company, at Waterbury, Conn., in their price-list, enumerate 155 different sizes of butts and hinges, all the dimensions of which are expressed in inches and fractions of an inch—the fractions used being one-half, one-fourth, and one-eighth. "The inch and these fractions are the four simple elements of that comprehensive language which pictures to the workman the exact size and dimensions of every hinge, and the relations of each part to the others." Change the unit, one inch, to the metre with its decimal divisions, and what follows? The inch has no exact equivalent in the new system. The dimension nearest to it is the centimetre, equal to four-tenths of the inch, nearly. Three of these parts exceed the inch by about two-tenths. A change of the unit of length in this establishment would carry with it the necessity of a change in the length of every butt and hinge, and of every piece of machinery by which they are fabricated—for there must be exact relations between the standard and the parts which it measures. In the description of a twenty-five horse power steam engine, made by the "Fishkill Landing Machine Works," we find one hundred and fifty-seven different parts. One part which is a fair average of the whole has twenty dimensions, nine of which are expressed in terms of the inch, and eleven in terms of the inch and its fractions. In the 147 different parts of the engine there are 2940 different dimensions—1323 of which are expressed in exact inches, and 1617 in inches and the fractions of an inch, the fractions being one-half, one-fourth, one-eighth and one-sixteenth. To these add the screw, with the screw-cutting machinery, including the delicate adjustment of its threads, and we get some idea of the value, or "virtue," of this unit. If we run through the whole circle of the mechanic arts we shall find that the inch and its fractional parts are the guides in every workshop in the land. They are the language in which science speaks to labor, in

which every mechanic thinks and reasons, in which he reads his scales and his working plans, and with reference to which all his tools have been constructed. Yet Professor Wilhelm flippanantly remarks, "The argument is as good for the new system as for the old."

We have no idea that the friends of the metric system have really given much attention to units. There is a practical as well as a sentimental side to the question, which their superficial glance has not included. They have not reasoned that comprehension is more important than reduction. Like all Frenchmen they are profoundly sentimental. They are in love with an idea. They start out in defense of their system with much confidence and enthusiasm; there is a specious and seductive appearance of learning in the terms, and of science in the arrangement, exceedingly fascinating. As they proceed we hear less and less of the unit, and more and more of the ratio, until we are justified in thinking they seek only ease of reduction, and have not considered the thousand practical, every-day affairs of life which would be injuriously affected by the change. The convenience of decimal notation is indisputable, but the duodecimal ratio was at first proposed for the metric system. It was found that with all its conveniences, the decimal division has the disadvantage of being itself divisible only by *two* and *five*. The duodecimal division, divisible by two, three, four, and six, offers many advantages over the decimal division. Delambre, in his "Base du Systeme Metrique," Vol. 3, page 302, admits fully the advantages of duodecimal over decimal arithmetic; but alleges the difficulty of effecting the reformation, as the decisive reason against attempting it. It was this defect in the decimal division which led to the addition of twelve pounds to the hundred weight, by which means it could be divided into halves, fourths, eighths, sixteenths, etc. Admitting, however, the convenience of the decimal ratio, its value is destroyed or greatly injured *if the unit is fixed*. A fixed unit requires a variable ratio. If the ratio is invariable, the unit must vary. Any system arranged in violation of these principles will fail in practical application. The friends of the metric system must direct their attention to this point. There will be sufficient time for rapture over its "beauty" after its practicability shall have been demonstrated. We have already shown that a unit of about forty inches is inapplicable to so small a distance as twenty-two miles, equal to about 35,404 metres. In so large a number, the mind cannot take cognizance of a variation of one or two thousands. Thirty-four thousand points and 35,000 points would not present sufficient difference to the eye to enable the mind to distinguish them. If we read it in kilometres we only use a different term for 1,000 metres, and the mind must go back to the unit of the table to estimate the value of the higher denominations. "The mind analyzes a denominate number in but one way; first to find its base, and secondly to find how many times or parts of a time it is taken." Hence, in the language of the metric system, the *base unit is constantly presented to the mind*. We are obliged to express all distances, great and small, by aggregating and dividing the

metre; and this gives us numbers incomprehensibly great for large distances, and very minute fractions for all small measures. If the yard were our only unite of measure, the mile would be expressed by 1,760 yards, and the inch by one-thirty-sixth of a yard. Would these numbers present to the mind as distinct ideas as one mile, one inch? The same metric unit must measure the diameter of a spider's web, and the distance to the sun. The apothecary must use the same unit that the wine merchant uses. The physician may be called on gravely to direct his patient to take the *one sixteen-thousand-two-hundred-and-fifty-fourth part of a litre* for a dose, instead of six minims or drops! When we reflect that the advocates of this system ask the enforcement of this foolishness by the compulsion of the law, we think it decidedly frigid to accuse us of "absurdity." But, says Prof. Wilhelm, "there would be no need to use too large or too small a unit." We can use no units but metric units, and we have never yet seen an argument showing that one unit can be used for all distances.

We are not advised to adopt French money, with its unit of \$18.75. Prof. Wilhelm seems satisfied with the American dollar, though he fails to show that it is metric. What he expects to prove by it in support of the metric system, we cannot imagine—unless he can show that it bears some relation to the ten millionth part of the earth's quadrand. If we do not consider the unit, the system might with more propriety be called the Arabic system. We expected to hear him speak of decadollars, centidollars, and millidollars. This would add the beauty of metric names to the simplicity of ratio. This is the language he would introduce into the mechanic arts and the every-day business of life. The table of American money as taught at school is quite a different thing from that of business. Our coins are of the value of one cent, two cents, three cents, five cents, ten cents, twenty cents, twenty-five cents, fifty cents, one dollar, two and a half dollars, three dollars, five dollars, ten dollars and twenty dollars, while paper bills run up to thousands. A ratio of ten with a unit of one hundred is not applicable to money. The people sought convenience, and the Government preferred to do violence to the ratio rather than to the unit.

One of the most damaging arguments against the metric system, is the condition of weights and measures in France. Some time since, I inquired of a gentleman, how far he resided from Strassburg? He replied promptly, in German, *three hours*—equal to nine miles. The system was born of revolution, and invented by men who scorned to measure anything by the length of a dead king's arm, who abolished the Sabbath—the seventh day—that they might devote one tenth of their time to the "Goddess of Reason," instead of one seventh to the exclusive worship of God. After almost a century it is still a failure. The weights and measures *do not at all follow the decimal scale*; for in all weights, and in all measures of volume, each decimal *has its double and its half*, while the *tables* are constructed entirely on the decimal scale. This discrepancy between the tables and the numbers in use gives rise to much confu-

sion, and is a striking departure from the decimal system. This departure from the decimal system has greatly multiplied the number of units, so that now, there are eight units of linear measure, three of square measure, three of land measure, fourteen of liquid and dry measure, six of solid measure (including three of wood,) and twenty-three of weight, making fifty-seven in all, while the tables of the system contain but twenty-eight. The discrepancy between the tables and the units in general use is a fatal difference between theory and practice, and must lead to complexity and embarrassment. John Quincy Adams, in his report to the House of Representatives, shows that the decree of 1812 retains the principle of decimal multiplication and division for the legal system, "but abandons them entirely in the weights which it allows the people to use." Instead of the metre it gives them a toise of six feet, an aune of three feet, and a thumb of twelve lines. And these measures "are divisible into halves, thirds, quarters, sixths, eighths, twelfths and sixteenths." Instead of a kilogramme, it gives them a pound of sixteen ounces, an ounce of eight gross, and a gross of twenty-two grains. In measures of capacity, wet and dry, the *names* and divisions of their ancient weights and measures, (though not the same *things*,) are restored. Would the French failure prove a success in the United States? With French tables and American money before us, who can endorse a fixed unit and an inflexible ratio?

We had intended in this article to suggest some changes in the English system that would adapt it perfectly to our wants; but intensely interesting and important as the subject is, we must forego our intention for the present. Our article has already swelled beyond our anticipations, and we must not forget that other and "abler" contributors have some claim on the columns of the *Microcosm*.

We shall be happy to read a defense of the metric system, ("if it is defensible,") provided it is logical and treats the subject in a methodical and scientific manner. *Suaviter in modo, fortiter in re*. Let us have hard facts, and soft words. We contend only for what we think right. We are not attempting to "burlesque" the English system, and we promise now never to perpetrate a joke in the *Microcosm* without sending Prof. Wilhelm a diagram.

FAIRVILLE, MO.

EXPERIMENTAL PHYSIOLOGY.—No. II. VIVISECTION—SCIENTIFIC CRUELTY.

BY R. P. LEWIS.

It may be well to notice in passing that the rage for experimental science has received its greatest impetus from the evolution philosophy; the theory may be sound, but the mistake lies in the fact that the pendulum of thought has been allowed to swing so far away from all phases of religion, that men are losing sight of the principles of natural morality and justice which have always been associated in the human mind with some form of religious faith. Nature must now be questioned about everything. Here are some of the modes of ques-

tioning adopted by the experimental physiologists; and if any one doubts them, chapter and verse can be given in the English papers or periodicals, the accounts being furnished by the friends of vivisection:

"Making artificial tubercles and fistulas in the lungs and stomachs of dogs; giving dogs emetics and then tying up their throats to make vomiting impossible; inflaming the spinal cord of an animal by passing a thread through it; dividing nerves of the most sensitive character; injecting all sorts of burning acids, acrid fluids, and virulent poisons into the veins of animals; cutting out part of the creature's liver or brains, or tying up its gall-duct; passing electric shocks through the exposed brain, or across the eyes, etc.; scraping away the corner of the eyes of frogs, and then burning them with nitrate of silver or acids; tying up the arteries of animals; tying up their intestines; dissecting the nerves of the spinal cord; inserting the limb of one animal into the body of another, or into its stomach, to be eaten off by the gastric juice; exciting the most violent agonies by injecting almost every kind of chemical or foreign substance, however deadly or caustic, into the jugular or other veins of animals; pinning them down on boards, or holding them in the grip of iron machines while the vivisector lays bare the heart, the liver, the brains, or other interior vitals; again setting them free, and leaving them in such mangled condition for weeks; piercing a spot on the brain of a rabbit, to see it spring from a table in a violent spasm of agony; opening the chest and drawing up the heart; irritating internal wounds with cantharides; cutting away parts of the liver of dogs and cats with a Galvano-caustic knife; opening the stomach of one dog, and pouring into it a mass of liquid prussian blue; into the stomach of another dog, a half pint of boiling water!"

To avoid the storm of indignation and disgust which these atrocities, when known, are sure to raise, the physiologists assert that they use anesthetics and as far as possible avoid giving pain to the animals. In reply to this, I quote from Baron Earnest Von Weber's "Torture Chamber of Science:—"

"By far the greater part of the experiments are now directed towards examining the organization of the brain and its reference to the nervous system; and for these, the unfortunate animals, while being slowly tortured to death, are not even allowed the benefit of anesthetics, as they would essentially interfere with the inferences to be drawn from the experiments."

In cases where anesthetics are used, they are only given in the first instance, to stupefy the animals till they can be secured and fastened on the operating table. Every Doctor knows that an animal cannot be kept under the influence of an anæsthetic during these protracted experiments—often lasting several days—without dying.

But the worst has not been told. Bernard says that when not otherwise described, it may always be taken for granted that an experiment has been made on a curarized animal. The same author says: "Curare, acting on the nervous system only, suppresses the action of the motor-nerves, leaving sensation intact; curare is

not an anæsthetic." Other authorities might be cited to the same effect, but I think physiologists are generally agreed that curare only paralyzes the motor-centers, and this necessarily heightens sensation. Let this fact be borne in mind, while we look at the observations of Paul Bert on a curarized dog. Bert succeeded Bernard, and I believe is now minister of Public Instruction in France. The animal was first rendered helpless and incapable of moving, or even breathing, which function was performed by a machine blowing through a hole in its windpipe. All this time "its intelligence, its sensitiveness, and its will remained intact—a condition accompanied by the most atrocious sufferings that the mind of man can conceive." This is Bernard's language. In this condition the side of the face, the side of the neck, the side of the fore-leg, interior of the belly and the hip, were dissected out, in order to lay bare respectively the sciatic, the splanchnics, the median, the pneumo-gastric, and the infra-orbital nerves. That is, the nerves were dissected out and left hanging like shoe-strings, after which they were excited by electricity for ten consecutive hours, during which time the animal must have suffered unutterable torments, unrelieved even by a cry.

The inquisitors then left for their homes, leaving the tortured victim alone with the clanking engine still working upon it, till death came, in the silence of the night, and set the sufferer free.

Now, if these statements, made on eminent authority, be true, the "anæsthetics" are used for the convenience of the operator, and to quiet the public conscience, and not from any consideration for the sufferings of the animals.

And here the question naturally arises, what good to mankind has been derived from all these waves and spasms of agony caused to millions of innocent creatures? I quote from the great German scholar, Von Weber: "The opinions of medical professors concerning the scientific value of vivisection, as well as about its usefulness to medicine, are much divided. With the same confidence with which the medical profession at Zurich, and Dr. Hermann, Professor of Physiology at the same place, maintain the absolute necessity and indispensability of vivisection, it is declared perfectly dispensable and superfluous by a number of esteemed Doctors and learned men who are universally known and respected in England. The celebrated Sir Charles Bell declared freely that the dissecting of living animals had done more to produce error than to reveal truth; and that, in general, experiments on live animals do not tend towards sound scientific discovery. Sir William Ferguson, one of the first surgeons of the world, was also a declared enemy to vivisection, and avowed that it is entirely useless to surgery. Others also of the highest medical authority in England have ventured to reject vivisection without reserve. No less than sixty doctors of medicine signed a memorial to the Society for the Prevention of Cruelty to Animals, in London, to engage that society to endeavor to limit vivisection as much as possible. The University of Dublin has abolished vivisection in her laboratories."

He then proceeds to sum up the conclusions of scientific men who oppose the practice, and presents them under the following heads:—

1.—"Practical medicine has derived no advantage worth mentioning from vivisection, either directly or mediately through physiology.

2.—"The cases where such advantage is demonstrably or theoretically possible belong almost exclusively to toxicology and surgery.

3.—"In most other cases medicine can entirely dispense with vivisection, as it only enriches diagnostics with such additions as can afford no perceptible indications to therapeutics.

4.—"Being superfluous it must become injurious, by drawing the attention of the doctor from the sick bed and directing it towards ends which have nothing to do with the medical art.

5.—"Apart from this unavoidable harm, it is sometimes dangerous in individual cases—as it may become the source of error, and thus be the indirect cause of incalculable evil."

The danger referred to in the last objection arises from several causes. If the animal organism be stupefied by drugs, it is obviously unsafe to draw the same conclusions from observations upon it as when its functions have their natural play; and when thrown out of its normal and unified condition by torture and then questioned, its answers are no more to be trusted than the forced confessions wrung from the victims of the Inquisition. Nature should be interrogated by natural means, if we would receive reliable answers.

Again, poisons have different effects upon different animals; and therefore no safe conclusion can be formed as to their analogous effects on the human body. Goats eat hemlock without hurt, and the common toad can even swallow prussic acid with impunity. Rabbits devour belladonna without injury. On the other hand, the sting of the African tsetse fly will kill the strongest ox; but is perfectly harmless to man, with his thin skin. Indeed, the physiologists have admitted that the inferences drawn from experiments upon animals are merely suggestive, and to be conclusive must be tried on man. If the trial should be made on a few of the vivisectionists, I have no doubt it would lead to good results.

Before leaving this branch of the subject let me call attention to the conclusions of a few of the vivisectionists themselves.

Dr. Brown-Sequard, one of the greatest among English vivisectionists, said in 1877: "The teachings of vivisection on the functions of the brain are a tissue of errors, and can only be corrected by clinical observations."

The French vivisectionist, Longet, has said the same in his "Anatomy and Physiology of the Nervous System."

Legallois, another great French vivisectionist, has confessed that the results of his vivisections have been just as various as the operations were numerous; and that in consequence he had abandoned the practice, not without regret at having sacrificed so many animals and lost so much valuable time. And, lastly, Claude Bernard, after thirty years of this horrid work, says: "Our hands are empty of results, but full, it may be, of legitimate promises for the future."

But even if all that has been claimed for vivi-

section by its most sanguine advocates were true, I should still hold, with Miss Cobbett, the brilliant English authoress, who stands for justice to the brute world as much as the author of "Uncle Tom's Cabin" stood for justice to the slave:—

"After all, our bodies are destined to perish, sooner or later, and the relief or help which science at its best can ever afford them, is a very small matter. There is a greater interest even than the sanitary interest of which we make so much in these days—it is the interest of the hearts and souls of men. It is of more importance that tender and just and compassionate feelings should grow and abound than that the cure should be found for any corporeal disease."

And now let us look away from the dark side of science for a few moments and ask ourselves what moral considerations, if any, may fairly come into force in our treatment of the lower animals. There is great force and beauty in the New Church conception, that our best moods are inspired by situations of great physical altitude. The man who could look from the summit of a mountain upon a city sleeping in the moonlight below and feel enmity towards any of its inhabitants, would be a savage. And what manner of person would that be who from such an elevation could behold the stir of rural life at early morn, when the smoke is curling above the farm-houses and settling in a fleecy vale of mist along the horizon, without a feeling of kindness for man and beast? The too common mistake of writers is that they fail to rise above the smoke of partisan strife so as to take an unselfish view of their subject. For instance, Dr. Wilks has written as a physiologist who desires to defeat a measure pending in Parliament, not as a man of humane instincts who has the moral good of the race at heart; hence his ethical conceptions are deflected downward by an atmosphere of selfishness. It is possible, too, that he has not fully recovered from the smart of the terrible lashing given him by the sarcastic author of "Hunter and The Stag." But whatever may have been the Doctor's motive or feeling, or lack of feeling, in writing on the ethics of vivisection, his general notions of right and wrong are altogether too precise to leave much play for the moral sentiments. He says: "The Duty of Man towards Animals, as an abstract question, is from its very nature insoluble; it can only be partially answered on the grounds of expediency, and these will vary according to age and nation." A better statement would have been, that it can be partially answered on grounds of morality; and then expediency will "vary," according to the higher education.

In Strassburg and Toulouse thousands of geese are sacrificed every year in the manufacture of the French dish known as *pate de foie gras*. I understand the process to be, that the animals are placed in a dark cellar, with nails driven through their feet, and slowly roasted alive for several days; when they are killed and their diseased livers, swollen to a weight of two or three pounds, are ground up to feed other geese who have been "differentiated" into "Lords of creation." This abominable business is carried on in Strass-

burg alone to the extent of half a million dollars a year, and of course "expediency" governs there; but if it should be tried in any American city that had a society for the prevention of cruelty to animals, and should be brought to the notice of its agents, the caterers would soon find it expedient to resort to some other way of making a living.

The science of morality, so far as it is a science, is progressive. The reflex influence of just actions intensifies moral convictions, and with increased intelligence come the larger applications. Hence it is that institutions and practices which in one generation are scarcely questioned, the next generation abandons—simply because it has come to know that they are wrong. With the crime of human slavery casting its dreadful shadow across two hundred and fifty years of American life, and reaching to the last decade of the first century of our National Independence, we must all concede that the motive of expediency is sometimes strong enough to blind educated and even moral people to the most elementary principles of justice. It would be less difficult now to convince any kindly disposed man that animals have rights which he is morally bound to respect, than it would have been a few years ago to convince the slave-holder of a like duty towards his human chattels. The conclusion of Dr. Wilks, "That a carnivorous animal like man cannot frame a code of laws in relation to his inferiors, or determine the rights of the lower animals on any Christian or other ethical principle, such as 'to do as we would be done by,' is of some weight as affecting the question of legislation in behalf of brutes; but its ethical force disappears when we reflect that the golden rule is observed in human relations, not so much because it is a recognized principle of Christian morality as because it is inseparable from genuine civilization and its exercise made possible by the convergence of all humanizing influences. Every intelligent person at the present day knows that the world is indebted for much of its purest morality to the example and teachings of men and women who have been trained in no theological school, and some of whom have rejected even the doctrine of a future life. The one feature in the social and religious life of our time which, to the enlightened humanitarian, contains more of promise than any other is its spirit of Catholicity. With increased facilities for personal intercourse and the interchange of thought, new lines of sympathy have been established. "The spirit of the living creature is in the wheels," and the wheels go everywhere. Every hour electric messengers traverse the continent in all directions, with tidings of joy and of sorrow, and go throbbing beneath the ocean to distant lands. In the great cities the offices of humane societies are connected by telephone, and instances of cruelty to children or brutes are reported promptly for such action as investigation may justify. The hearts of legislators have been touched, and the strong arm of the law reaches out to protect the helpless. Dogmatic tests of faith are giving way before the feeling that, "His can't be wrong whose life is in the right." And there is a growing sentiment that the difficulties between nations ought

in all cases to be adjusted by arbitration instead of by appeal to the sword; not only because it would better serve the ends of justice, but in order that the strength and skill now devoted to destruction may be given to the cultivation of the arts of peace.

And now, having reached a stage of moral advancement when the general sentiment of educated people favors the largest possible exercise of justice, does any reflecting mind doubt that the principle in its last analysis affects our relations to the brute creation? If it does, then our duty toward the animal world must be as unquestioned as our duty toward man; differently defined, of course, by the relative positions of man and other animals in the scale of being. In other words, the spirit of the golden rule is broad enough and just enough to bless the life of every sentient creature; and it is a part of practical morality to give it that application. This appears to have been Solomon's thought when he said, "The righteous man regardeth the life of his beast; but the tender mercies of the wicked are cruel."

If the physiologists feel that their work is in danger of being interfered with by a growing sentiment of natural justice, let them keep the contest on the Jesuitical ground that "might makes right," and not stultify themselves, as Dr. Wilks and some others have done—by speaking well of humane societies, and in almost the same breath ignoring the vital principle of the whole movement. Did space permit, I would be glad to hold up to the scorn of the humane reader the miserable excuses by which some men, calling themselves Christians, and others who would like to be called philosophers, have sought to justify the most atrocious barbarity toward creatures inferior to themselves only in point of intellect. No question of man's superiority over the brute can by any possibility ever be raised; and yet we have in the current history of crime, abundant proof that man can sink as far below the brute as by nature he is entitled to rise above him. When we think of such characters as Probst and Pomeroy, and the Benders and Jameses, who could cut up innocent babes, simply to gratify a native thirst for blood, the superiority of man over the brute is seen to be due to other qualities than mere intellect. Look at the large-eyed, patient ox that wears out his life in the service of man, the horse that knows his master's voice, and responds to his every wish, and the Saint Bernard or Newfoundland dog that watches over his owner's property and rescues his children from drowning; and then say if "men whose noted conciousness and wisdom give them the terrible responsibility of being moral authorities," do not make a mistake when they ignore all ethical considerations in the treatment of such beings. Of course, they can do this only on grounds of utility; but this places the agnostic in rather a singular position; for he estimates the worth of a human life, not with reference to personal immortality—of which he has no conception—but as it may affect for good the future of the race *in this world*; and it will not be denied, that the example of some animals is worth more than that of some men.

In conclusion, if brutes have no future life, that is no reason why they should be denied all

happiness in the present life. These creatures have never sinned, yet they must suffer, and, according to the common faith of Christendom, they will receive no compensation in another life for the injustice done them here.

Sir Henry Taylor has said:

"Pain, terror, mortal agonies that scare
Thy heart in man, to brute thou wilt not spare;
Are their's less sad and real? Pain in man
Bears the high mission of the flail and fan;
In brutes 'tis purely piteous."

The first and most important application of the golden rule is the regulation of human relations; yet the minimum of our duty towards those, who cannot speak for themselves, is—not to torment them.

EAST SAGINAW, MICH.

INTUITION AND REVELATION.

BY J. W. LOWBER, M. A., Ph. D.

All true philosophy depends upon a proper understanding of the intuitive element of our nature. Many false systems have been built upon incorrect definitions of intuition. Theodore Parker, in all his works, confounds intuition with instinct. The word intuition is derived from the Latin *in*, and *tucor*, to look; it is that faculty of the mind by which truth is immediately perceived. It requires no process of ratiocination, but it is the act by which the mind immediately perceives. The axioms of mathematics and the primary principles of all science, are of that character. No progress can be made in science and philosophy without time, space, and cause. Our ideas of these things are strictly intuitive. We can imagine all events as having never occurred, but we cannot imagine the non-existence of time. We can conceive of empty space, but we can form no conception of the annihilation of space. It is impossible to conceive of an event without a cause. We can easily imagine things as having never occurred; but when they do occur, there must be a cause.

The ideas of space and time, are called, in philosophy, necessary ideas; the belief in the relation of cause to effect is a necessary belief, and all axioms are necessary truths. These intuitive truths are not only evident, but they are self-evident. The mind on the bare contemplation of the object, perceives it without the necessity of any foreign evidence. Necessity is a secondary, and universality a tertiary, test of intuitive truth. A proposition is not true because we must believe it, but we must believe it from its self-evidence. As necessity flows from self-evidence, it must become a test. Universality is not a primary test of intuition, for the instincts are universal. The desire for food is universal. Universality when joined to necessity and self-evidence becomes a test of intuition.

Theodore Parker maintained that man has an instinctive intuition of the Divine Existence. We do not believe that the Divine Existence is strictly an intuitive truth. It will not bear the tests of intuition. While it is evident, it is not self-evident. Sir Isaac Newton claims that space and time are attributes of God. As attributes they must inhere in a substance, and

as they of necessity exist, God must also of necessity exist. There is a step of reasoning here, and the truth cannot be called intuitive, although based upon the intuitions of time. Conscience, while it points to an authority above itself, does not compel us to believe in the existence of God. What is unknown to intuition itself, is revealed in the Word of God. And this revelation satisfies intuition, which, then, connects the law with the lawgiver. Intuition teaches us that we are dependent beings. There cannot be a dependent being without an independent one. Man is a dependent being; therefore, his Author is an independent one. The Bible reveals God as man's author. Mr. Parker also taught that man has an instinctive intuition of his own immortality. This is not true, for it will not at all bear the tests of intuitive truth. We can imagine the non-immortality of the soul, and conceive of no existence for man after death. While man instinctively anticipates a future state of existence, there is no real intuition of existence after death. Life and immortality have been brought to light through the Gospel. This revelation of the Divine will, perfectly satisfies the instinctive longings of the human heart.

Theodore Parker failed to discriminate between inspiration and illumination; between revelation and dictation. He confounded the natural illumination of the human mind with the inspiration of the Bible. Shakspeare is presented as an example of inspiration. He was a great genius, but his writings can not be translated into life, and convert men and women into what the Bible converts them. The tree is known by its fruit; and compare the influence of the Bible upon the lives of men, with that of any other book, and it is not difficult to understand the source of the Bible. The Bible is a revelation from God; but it was given through man, and has in it a human element as well as a Divine one. It is a perfect guide for man. Man's moral intuitions soon lay aside heathen religions, but the Christianity of the Bible bears the highest tests of truth.

LANCASTER, KY.

RESONANCE.

BY REV. T. NIELD.

Age has given richness to the tones of violins made by the old Italian makers. This has led to attempts to forestall time by baking the wood, as also by chemical process to secure the same result. From this it appears that hardness and dryness in the material are essential qualities in making good violins. In securing these, the wood is freed from moisture and other evanescent substance that is of inferior conductive and resonating power—retaining only that which has the greatest affinity for acousticity, while securing the maximum of elasticity, and so increasing its vibratory power.

When the rosined bow is drawn across the strings, the energy is expressed through friction so communicated to the strings, causing tremulant emissions of acousticity, upon whose vibrational velocity depends the fundamental sensation of hearing, as the effect of sound.

The energy, however, does not confine itself to the strings, but passes on through the whole body of the instrument in reciprocal tremors; for, being generated and governed by the strings, their vibrations must be in unison with those that form the tone, and so they are resonant, reinforcing the strings in the emission of acousticity. In considering the physical act, it is obvious that the wood of the instrument cannot return more energy than it receives from the strings. And were resonance merely a rebounding of sound generated by the strings it could, to say the least, add nothing to the sound. But resonance increases the volume of sound many fold; from which we conclude that it expresses—not the initial sound, but the surplus energy of the initial act that produces the sound. Now we proceed to consider the mode of resonance. The conductive affinity of the wood of a violin for, and its sensitiveness to, the motions of acousticity are such that its molecules are sympathetically agitated when acousticity is set in motion by the bow. This motion acts as a stimulus to some quality in the wood, awaking a dormant emissive energy which expresses itself as a supplemental, momentive force, intensifying the tone. This is its elasticity, or spring-power. When the bow is drawn across the strings, the physical energy of the player, as we have said, is communicated to the entire instrument. The point of contact between that which imparts and that which receives the energy is the one from which the acousticity is set in motion. This motion, governing the vibrational number, so governs the tone; and the supplemental being subordinate to the initial must be in the same tone, and a reinforcement of that tone. The expression of the energy, as we see, is in vibrations that emit acousticity. These vibrations are to-and-fro motions of the vibrating material. Motion implies action of the molecules of that material one upon another. Action implies reaction. This implies alternate compression and expansion. The greater the capacity of the molecules for compression and expansion the greater is the resonating power. Here, then, is resonance in a sentence:

The energy of the active agent partly expresses itself through the first point of contact with the sounding body; but, not exhausting itself there, passes on and expresses itself further in vibrations of the other parts of the sounding body, the spring-power of whose molecules causes them to reciprocate the time-action of the initial motion and emit acousticity in resonating rebounds.

A rubber ball thrown against a wall comes back with force, because the unexpended force expressed in the forward motion is partly concentrated in the compression of the ball which, returning to its normal shape, receives the expression of the force in reversed motion. So with the compressed molecules of a resonating substance. Their "sudden starts and stops," their compressions and rebounds, emit acousticity simultaneously, and in harmony with the whole; thus forming a symmetrical tone, which includes and expresses the rebounding energy. A few facts may be cited in support of our theory:

1. A piece of rubber will not emit sound

until stretched to a point where its molecules by impact acquire spring-power. So with twine, etc.

2. A cracked bell loses its resonance to the extent that it loses its spring-power.

3. Lead and kindred substances whose molecules are without spring-power are incapable of resonance.

Now we come to consider an extraordinary phenomenon in resonance. In "*The Problem of Human Life*," page 79, it is stated as follows: "If two strings or forks are tuned to perfect unison, or in such a way that they will make the same number of normal oscillations in a second; and if one of them is thrown into vibration, its unison neighbor, if placed near enough to it, will also start into vibratory motion, and sound audibly without any connection whatever with the actuating string or fork, except the intervening air."

In ordinary resonance, as in the playing of a violin, there are two causal factors—the initial energy that determines the vibrational number through the strings, and acousticity in motion that causes the energy to develop into a sympathetic emissive discharge. In the case as above stated, the vibrational number is pre-determined, so that the instrument requires contact with no physical energy. Here, let us look at the favoring conditions:

1. A tuning fork and a violin string are amongst the best generators of sound; and the resonating capacity of a substance is commensurate with its generative potency.

2. They are amongst the best conductors of sound; and conductive faculty implies readiness to receive.

3. The instrument is sympathetically sensitive to the motions of acousticity, and has a tendency to reciprocal emissive activity.

4. The air which is itself a conductor intervenes between the instruments.

From the foregoing we conclude that the fork or string resonates by induction, receiving acousticity from the intervening atmosphere, while yet the discharge has not had time greatly to diffuse; and that the molecules of the resonator are agitated by the motion of the passing acousticity, and by the conductive momentum, resulting in its discharge. This may be termed inductive resonance.

We see no greater difficulty in accounting for this phenomenon than that of a board, glass jar, &c., when touched by the handle of a tuning fork that has been struck, resonating the tone. In the latter case the fork forces its own vibrational number upon the resonator. This is done through the residuum of physical energy yet moving in the fork, and communicated by contact. All else is the result of conduction. Here we lay it down as a law in resonance that only physical energy communicated by contact of the sounding body with the resonator can force the vibrational number of one upon the other, while only acousticity in motion, by sympathetic agitation of the molecules in conduction, can make one instrument resonate the tone of another, when there is an intervening space between them; in which case they must be tuned to unison, and the resonator be placed in the most favorable circumstances to induce conductive activity.

We intend to close our remarks on Sound with a paper on Individuality in Tone.

THE MODERN THEORY OF FORCE.—No. II.

BY REV. JOS. S. VAN DYKE, A. M.

In its nature, force is immaterial. The materiality of the forces has been successfully disproved by the most eminent specialists in each branch of science. I will not weary the reader with quotations. The dynamic theory is held by Joule, Carnot, Rumford, Rankine, Clausius, Helmholtz, Dana, Thomson, Mayer, Faraday, Grove, Liebig, Maxwell, Youmans, Carpenter, Ferrier, etc.

There is, we concede, in the scientific discussions of the present day, a needless perplexing confusion of motions and forces. As a definition of force, we accept that given by Mayer, "that which is expended in producing or resisting motion." Motion, then, is the exponent of force. We believe, with Sir John Herschel, that the soul is a real creative force.

As we have the testimony of science that there are immaterial forces in Nature, there certainly is no preventive presumption, against the doctrine of a personal God; nor, against the doctrine that the soul may be spiritual. If the physical forces are immaterial, there evidently is no basis for the assertion: "It is unscientific to believe in an Infinite Spirit and immateriality of mind." Such an assertion is in direct antagonism with the testimony from analogy as presented by modern scientific investigation. Every falling stone, as it moves in obedience to an immaterial force, testifies to the possibility of a God, and of the soul's spirituality. The flash of lightening that splinters the cedar at my door, being immaterial, burns upon the blackened fragments that lie at my feet. "A God may be; the soul is immaterial, immortal." The heat that warms my shivering body, being immaterial, tends to thaw the icy doctrine of materialism from out my grateful heart. The morning light, which bursts in at my chamber window and photographs dancing beams on the floor; which imparts color to my cheek and cheerfulness to my heart, testifies, "There is no presumption against the existence of the Great Spirit, and no improbability against the soul's immateriality. If reason, as employed by theologians, can present evidence in favor of either doctrine, belief is entirely rational.

Though the testimony of those who regard forces as substantive entities, should be ultimately overthrown, still these forces would open the gates of the unseen world wide enough to afford glimpses of the strong probability of purely spiritual existences. Forces are extremely diverse from matter. They build up matter. They organize matter. They decompose organisms. The vital force which builds up the human organism exists before organization begins. If it exists before organization, may it not exist independent of it, and continue to exist after the organism has perished? Is not modern science beginning to give us transporting visions of a spiritual world, and of man's deathless destiny?

Is it not competent for the teleologist to say: "intelligent results are not effected by blind

forces, except as they are directed by intelligence?" The assertion that they are, I am not called upon to disprove. You must prove it. Until you do, reason impels me to believe that design implies a designer; intelligent results, an intelligent agent. Though I may not be able to see the pianist at the key-board, nevertheless, by the principle of causation, I am forced to believe he exists. If I were not, it is a sufficient refutation of your theory, O materialist, to affirm,—Life is not in the piano, but the pianist. I also have a right to make assertions. Disprove them. Before you have succeeded, planets and even suns may go on cooling till they have become eternal icebergs. Before the preponderance of testimony shall be in your favor, your hypothetical "mind-stuff," diffused through hypothetical ether, will have time sufficient, if it only has power adequate, to evolve an infinite intellect, of which it seems to be giving promise, in that it has evolved finite intellects equal to the task of believing that the interstices between the atoms of platinum are filled twice—once with ether, once with "mind-stuff." If I should assert that your principle of evolution—being the only thing in the universe which does not need to be evolved—had already succeeded in evolving an Omniscient Personality, could you disprove my assertion? If I asked you reverently to bow the knee before this Infinite Majesty, whom your all-potent evolutionary principle, acting through unnumbered milleniums, may have long since evolved into being, could you assign any sufficient reason why you should charge me with raving fanaticism?

If any one expects me to believe that the ordinary forces of nature, without direction from a superintending intelligence, can produce the phenomena known as life, he must do more than assure me that certain scientists accept this theory; that they present labored arguments; that they confidently expect to furnish unanswerable proof, by-and-by; that they boastingly prophesy that, in the next generation, every one will believe it; that, in fact, all donow, except "the illiberal," "the bigoted," "the ignorant," "the prejudiced," "the narrow minded," and "the orthodox dupes." He must present incontrovertible evidence now that there is no vital force which employs, directs and controls physical forces. Our children will be able, we humbly trust, to do their own thinking; and if the argument from design shall be refuted in their day, will have candor sufficient to acknowledge it. But there is nothing gained by cudgeling the heads of this age with the prophetic science that is still in the clenched fist of the future. Neither God nor the equity which evolution has uncoiled calls upon me to fight enemies yet unborn; consequently, until these unanswerable arguments are presented—and no one claims that they can be found in the libraries of the world—reason will continue to constrain the belief that physical forces, potent as they are, are nevertheless powerless in themselves to produce intelligent results.

A SINGLE idea or scientific suggestion is often worth, to a student, many times the price of the publication containing it. Send \$1.00, and receive this volume from the commencement. It is full of valuable suggestions.

ANOTHER DISCOVERY IN SOUND.

BY CAPT. R. KELSO CARTER.

In explaining the existence of the octave heard at the edge of the fork, which octave was discovered by Dr. Hall and myself, we deliberately stepped into an apparent corner with no visible hope of escape. The fork prong makes 512 single vibrations, all of which are, of course, heard through the air by the ear; but when the glass tube is held close to the edge, at or near its centre line (at the centre in the case of a straight bar,) the octave is heard. This octave must be produced by a double number of vibrations, and we deliberately claimed that the 512 singles became one sound *in the steel of the fork*, and when listened to through the glass tube were transmitted through the steel, and then through the air to the ear, as a faint note; and that this note is, as observed, the octave. Now this octave would require a fork making 1024 single vibrations to produce it, if listened to in the ordinary way. It is also plain that the whole 512 reach the ear in the ordinary way through the air, and that no greater number can possibly reach the ear when listening through the small tube. In fact, if the ear was in the steel of the fork we can not conceive of it taking notice of more than 512 single vibrations. How then can C³ be produced when made by *the fork*, and transmitted through the air, and C⁴ be produced when made *in the fork* and transmitted to the air? Here we begin to get on the track of a most wonderful fact, discovered by the writer while seeking an explanation of this mysterious, but undeniable, octave. We were, to use a phrase of the day, "badly stuck," for we were confronted by the following facts:

1. The ear hears 512 single vibrations through the air.
2. An octave is produced by a double number of vibrations.
3. The number of vibrations is not doubled.
4. Nevertheless there is the octave, plain and distinct.

At this point Prof. Tyndall came to the rescue. It is not often that your adversary furnishes you with such capital ammunition as in this case. While reading the "Lectures on Sound," we were struck with a fact mentioned on page fifty-five. Prof. Tyndall was describing the first approach to a Siren, when he stated that if a stream of air issuing from a tube be checked 720 times in a second, the note *g in alt.* will be sounded. At this point we made our discovery, to which we specially call the attention of every student of acoustics. In order to get at it in the plainest manner, let us quote from Tyndall's description of the improved Siren, page sixty-eight. He is endeavoring to prove to his audience that the number of vibrations made by a fork, may be actually counted by the aid of the Siren. In order to do this, he sounds the fork, and causes the plate of the Siren to rotate until the notes produced by the two are exactly in unison:

"I allow the disk to continue its rotations for a minute, exciting the fork from time to time to assure you and myself that the unison is preserved. * * here recorded on the dials we have the exact

number of revolutions performed by the disk—1440. But the series of holes open during the experiment numbers sixteen; for every revolution, therefore, *we had sixteen puffs of air, or sixteen waves of sound.* Multiplying 1440 by sixteen, we obtain 23040 as the number of vibrations executed by the fork in a minute. Dividing this number by sixty, we find the number of vibrations executed in a second (by the fork) to be 384."

Notice particularly that he tells us that, the Siren makes 384 *puffs of air* in a second; and most particularly that he says, distinctly, that *one puff is one wave of sound.* With the Siren then a single puff of air escaping through a hole in a disk constitutes a vibration, or a pulse, or a sound-wave. But with the fork we find the case very different. Here we see that a single puff or motion does not constitute a vibration, but only half a vibration. On page sixty-nine, Professor Tyndall says:

"It is important to note that when I speak of vibrations I mean complete ones; and when I speak of a sonorous wave, I mean a condensation and its associated rarefaction. I include in one vibration one excursion TO AND FRO of the vibrating body. Every wave generated by such vibrations bends the tympanic membrane once in and once out. In France, however, a vibration consists of an excursion in one direction, whether to or fro," etc.

Aside from its usefulness to our argument, this quotation is a regular case of suicide. In the matter of the Siren, 384 puffs of air issue from a tube in a second. Each puff is a motion forward from the mouth of the tube; there is no backward motion, in any sense whatever. A single puff of air suddenly issues from the tube, and moves only forward. It does not move backward at all, much less move equally in the opposite direction. This single puff, having only one motion in one direction, clearly constitutes the pulse or vibration or sound-wave; and so we are assured by Prof. Tyndall, who says, as we have seen, "*sixteen puffs of air, or sixteen waves of sound.*" A puff is a wave, and in this case a wave is a puff. But, again, Prof. Tyndall assures us that a "vibration" is to be understood as a "complete vibration," a "condensation and a rarefaction," "*one excursion to and fro of the vibrating body.*" But in this case, the air itself is the vibrating body, the puffs of air form the sound-waves. If we wish to be strict with the Professor we can insist that he means to say, that the identical puff, issuing from the tube, becomes a wave of sound; for he says, on page sixty-six, "*In this way, by its passage through the Siren, the air is moulded into sonorous waves.*"

Now we would like Prof. Tyndall to explain how a puff of air, that has only one motion, "to," and not "fro," can, by his own definition be called a wave of sound, or a vibration. He insists on it that a vibration must consist of two motions, equally distinct, one forward and the other backward: or else it is only a "semi-vibration." Yet he calls a single puff of air, which manifestly has only one motion, a complete vibration; and even compares it with a complete vibration of his fork. It is certainly clear that in no way can two motions, or an "excursion to and fro," be assigned to the puff of air. The puff comes out of the tube with a positive forward motion; this motion is not

suddenly checked *and reversed*, as in the case of a fork's prong, but is left to expend itself against the yielding atmosphere. The stream is suddenly cut off, but no one will be so foolish as to claim that the stoppage of the supply of wind is a reversed motion. If it is, then the stoppage of wind constitutes the "vibrating body;" for the Professor assures us that the "vibrating body" must make the "excursion to and fro." Again, if anyone, in desperation, declares that the starting and stopping of the air constitutes the necessary double-motion, we simply refer him to the tuning-fork, which manifestly stops and starts at each end of its swing, or four times in a complete "excursion to and fro."

We hold it to be absolutely demonstrated that the puff of air makes only a "semi-vibration," or a single motion forward; that the fork-prong makes a double-motion "to and fro;" and that, notwithstanding this difference, the Siren and the fork produce precisely the same note when listened to in the ordinary way. What is the explanation? Let all students of acoustics carefully consider the following. The Siren produces sound by using the air itself as the agent. The air makes the sound *in itself*, and conveys this sound *through itself* to the ear—which is situated in the vibrating medium itself. In this case, one motion, or a semi-vibration, produces the effect on the ear of a certain note in the scale. The fork produces sound *in itself*, and does not convey this sound to the ear at all; but is forced to hand it over to another medium, the air, to convey it to the ear. In this case a double-vibration is necessary to produce the same note.

Now we have a formidable question to ask the wave-theorists. *Let them dare to answer it either way.* If sound is produced by a vibrating piece of steel and were my ear buried in the steel itself, would I hear anything? We boldly assert that no man living can attempt to answer that question, from the stand-point of the wave-theory, without hopelessly giving up the whole thing. We are told that steel conducts sound much better than the atmosphere; then, of course, if I was surrounded by a vibrating steel mass I would surely hear. But what would I hear? Sound-waves? We need not follow this any farther, but will leave it with an open challenge to anyone who can summon the courage to attack it.

Now we claim that the facts above cited furnish very reasonable proof that, if the ear or auditory nerve were buried in steel of the fork's prong, the 512 single vibrations of the prong, being made *in itself*, and conveyed *by itself* to the ear, precisely as is the case with the Siren puffs, would produce a note an *octave higher* than is accredited to the fork when heard, by change of conducting medium, in the air. This is theory, but now we have the experimental evidence. As related above, when a tube is held close to the edge or top of the prong, *this identical octave is distinctly heard.* Why? Because, as just stated, the single vibrations of the prong, *in itself*, produce the higher tone, just as the air-puffs undeniably do in the air; and this higher octave is conducted by the steel to its outer faces where it is transmitted faintly by the air through the tube to the ear.

Of course it is best distinguished along the centre line of the edge, half way between the two vibrating faces of the prong; and also its faintness prevents its being heard at all, unless the louder sound of the fork is shut off by the tube.

Now if some inquirer asks why it is that single vibrations count when the ear is in the vibrating body—and double ones count when the ear is not in the vibrating body—we simply answer: ask Professor Tyndall that question. We are indebted to him for a solid fact, viz: that a single air-puff actually produces the same effect on the ear as a double fork-vibration. He furnishes the fact, let him explain it. We are certainly not called upon to do so, in advance. It has merely been our good fortune to discover, from his facts, that:—

When the ear is in the vibrating body, a single or semi-vibration produces the same effect as that produced by a double or complete vibration when the ear is not in the sounding body.

This is our great discovery, and we hand it over to Prof. Tyndall and his fellow believers in the wave-theory for their consideration and explanation; if indeed, explanation be possible. We do, however, claim that, by the aid of this demonstrated fact, we have given a reasonable explanation of the existence of the octave at the edge of a fork-prong, and also of the so-called "silence corners" of the wave-theory. This will do for the fork-problem; now for the Chladni Plates.

PA. MIL. ACADEMY, CHESTER, PA.

COLD AND HEAT.

BY REV. J. W. ROBERTS.

That the system of Natural Philosophy accepted as true by the scientific world, and which is taught in our schools and colleges, is in need of some radical amendment in at least one direction, I propose to show in this paper.

Heat occupies a very prominent place in every work on philosophy, and its properties are elaborately discussed, while cold is turned off without any consideration whatever—save that it is the absence of heat—and is only alluded to in the discussion of the later when its presence compels attention.

Prof. Wells, in his *Natural Philosophy*, page 206, defines cold thus:—"Cold is a relative term expressing only the absence of heat in a degree, not its total absence, for heat exists always in all bodies." All other writers on the subject follow substantially the same line of expression in defining cold, so that this may be accepted as the true status the term, and whatever it represents, holds in science and philosophy. This being the universal estimate placed upon the word, and that of which it is designed to convey a correct idea by all lexicographers, it is with eminent propriety that the editors of the *American Cyclopaedia* ignore the word and the subject altogether in that elaborate work, except to speak of "catarrh" which is an incidental effect of cold. The other cyclopedias treat it, as do the philosophers and lexicographers, as a mere negation or privation, and not as a sub-

stance or an entity which has any existence; and on this basis our entire system of natural philosophy in this direction is founded and built up. Is cold a mere negation, the simple absence of heat? To the consideration of this question, which is a vital one, let us now rationally address ourselves.

If cold is only a "relative term implying the privation of something else, then it is not, and cannot be, an entity, and has no tangible or intangible existence. To show that this is its true position in Nature, it is compared to *silence*, which is but the absence of sound. Sound, however, is an effect of motion, and has no adequate resemblance to heat; while silence is no more comparable to cold than any other inactivity whose effects are never visible, and whose very existence, if it have any, is unknown by any product of its own powers. Silence may be classed as a negation, because it never gives any token of its presence or existence by any acts of its own, or that can legitimately be traced to it as an efficient principle, or be considered a part of itself.

Cold is also compared to darkness, which is the absence of light. It might be claimed with reason, possibly, that darkness is something more than the privation of light; but for our present purpose, this definition may be accepted. But we know how darkness comes, so far as we know anything of it at all. It is simply the shadow of a material body. The earth's shadow makes the darkness of night, alleviated or increased by the absence or density of the clouds and other vapors in the atmosphere. As the earth intercepts the rays of light from the sun, causing shadow and darkness, so any smaller body may be placed to intercept the rays of light from any source, and cause a shadow. But darkness has no power. Of itself it performs no acts. Bodies or substances passing through it undergo no change. Its presence is perceptible to us, and therefore it is *something*; but as a force in the universe it is simply a negation, so far as human knowledge extends. Neither of these—silence or darkness—has any adequate resemblance to cold. Neither of these will quench animal life, affect material bodies of any kind, be made useful in the avocations of life, or in any manner, or for any efficient purpose do anything whatever. How is it with cold? I assert, here and now, with the most emphatic assurance, that cold is one of the most potent forces in nature, scarcely, if any, less than heat itself.

I hear one say: "Why that is flying into the face of the wisdom of ages!" It matters not. If there is any one thing that men ought to free themselves from, it is the dogmas of the past which are only dogmas, and have no other tenure of existence, except that some man or set of men have given them to the world. I do not mean by this that men should cut loose from all conservative moorings, for this would result in anarchy; but I mean that no statement should be taken as true, simply because it is hoary with age, or, even because it has received the sanction of great men in all ages. Great men are often mistaken, and quite as often accept what other great men have said or taught as true without question or investigation.

Let us now candidly and rationally look at the *facts*, in the elucidation of the subject in hand; for one ounce of fact is worth a ton of theory or assertion.

Does cold *do* anything? Says the advocate of the existing theory:—"No; cold is only the absence of heat, and hence by no possibility can it do anything. It is a mere result of privation, and has no real existence except as a negation." Very well; that will do as far as it goes; but what are the absolute and unmistakable phenomena?

By some process a vast range of the most wonderful effects in Nature are brought about. Notice a few of them. The whole Arctic ocean is so far made a body of nearly solid ice that its navigation is rendered impossible. By the same process the lakes and rivers of the temperate zone are partially congealed and the soil frozen, with all other things correspondingly affected. This same something, which works these astonishing results in these wide fields of its activity, takes hold of a bar of iron or steel with the grip of a giant of fabled antiquity, and in its mighty grasp condenses it so that the length, breadth and thickness are all reduced. It will expand a small quantity of water in such a manner as to burst asunder its most tenacious environments. It will envelop a whole hemisphere in snow and ice and frost, and hold unrivalled sway over vast regions where the foot of man has no resting place.

These are but a trifling portion, in number, of the wonderful things done by this same thing. It is not the work of heat, for its action is exactly the reverse of what we here see in every particular; and on the well-known principle that "like produces like," it becomes impossible for heat to give birth to any substance or force that could produce results so diametrically contrary to its own nature and essence. What, then, is it? A mere negation? Can a negation do these wonderful works? A negation is nothing. Can nothing rival the most stupendous forces of the universe in its achievements? The idea is absolutely preposterous. It is far more unthinkable than the notion that something can be created out of nothing; for it might be conceived not impossible for an Omnipotent Being to "create by the word of His power" alone; but that nothing, without any supervening Omnipotence, could accomplish such matchless achievements as are here pointed out, is an utterly unentertainable proposition. Reason, logic, philosophy, science, common sense all unite in treating such an idea as outside the pale of consideration.

But there are the facts; what is to be done with them? No one will claim that they are miracles. What, then, are they, and how are they produced? I fancy I hear an advocate of the current system of philosophy saying: "Why, sir, you ought to know that these effects are the results of the absence of heat. That is what all philosophers teach, and you must be stupid not to see the fact."

Certainly, my friend, it is the absence of heat that produces these results; for if heat were present in sufficient force they would not be produced. But permit me to kindly suggest that that is begging the question. In a majority of the cases which come under our observation, in this zone at least, there are times when

heat has the ascendancy over all visible Nature. Will you be kind enough to inform me what causes the heat, thus securely entrenched, to leave her domain? Has it no power of resistance? Does it yield up a large portion of its empire without a struggle? Does a mere negation, a nothing, drive it out and usurp its place? That would be a miracle by the side of which all miracles that are recorded in sacred song or story would pale into insignificance.

On the contrary, we know that heat is tenacious of its hold and never lets go except under compulsion. Hence it is not a supposable case that it abandons any spot or relinquishes its claim to any place in any part of its domain without a struggle; much less evacuate any fortress without even a demand for surrender; and if there is nothing to make a demand, of course no demand can be made.

And yet all around us, almost constantly, we have the most conclusive evidence that heat gets out, and cold gets into all kinds of substances; and we again ask the question: How is this radical change brought about? Does the heat, by some law of its own, go out—commit suicide—or is it *driven* out?

As the present system of philosophy denies to cold any veritable existence, and classes it among nonentities, it follows, under that teaching, that cold is not a factor in these transactions; for that which has no being cannot act. Then we are to look for all the results obtained to the action of heat alone, if this system is true. Now suppose there was some law of heat by which it could take itself out of one place, what possible quality in the simple act of removal is there that could have any effect in producing *cold*? Cold is the antipode of heat—its exact opposite. Now can any act of this force produce its opponent? create an enemy? I will now summarise these reflections in two queries, which have already been partly anticipated, but which are now placed in condensed form for the contemplation of those who are interested in the subject:

What causes or induces heat to leave any place or substances? and how can the simple act of heat retiring, result in cold?

As these queries have never been suggested heretofore, and never answered, of course, so far as the writer has knowledge, they will be left for the philosophical consideration of those who feel inclined to grapple with them.

(Concluded next month.)

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In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

DIVINING ROD—WATER WITCHING.

Our readers—at least a vast majority of them—are probably not aware of the importance attached to the “divining-rod” in many parts of the country. It is believed in by thousands, yes, tens of thousands of intelligent and educated people, many of them claiming to be scientific investigators; and it is claimed that this simple pronged rod, or *baguette*, as it is termed in French, in the hands of certain sensitive or electrically gifted persons will indicate subterranean water-courses, ore-veins, coal-beds, etc., bending downward as the operator passes over such deposits with the rod in hand. It is claimed further that coal-beds of immense value have been located, and that their exact depth and thickness have been accurately described and mapped out before any shaft had been sunk, and where no indications warranted such conclusions. And this, it is insisted, has nothing whatever to do with modern spiritualism, being, as claimed, many centuries old. It is even urged that Moses was the original “dowser,” and that his striking the rock with his “rod” to bring out water for the thirsty Israelites, was simply an exhibition of the beauties of the *baguette*, and no sort of a miracle. God simply told Moses how to use this force of Nature and what kind of device was necessary to make it effective, just as Joshua's rams' horns at the walls of Jericho were simply an application of the wave-theory of sound under Divine instruction, according to the advanced science of certain high professors in some of our colleges, as explained in a recent editorial article.

The divining rod consists of a simple green forked twig, cut preferably from the witch-hazel, though many “dowsers” use peach, white thorn, and various other kinds of green twigs. To get an accurate idea of this rod, suppose the two forks of the twig to be, near their junction, the size of a common lead pencil, and about a foot long, and that the heavy end of the twig, where the two branches unite, is about six inches long. To hold the rod in the improved water-witching style, the two branches are seized in the hands with the palms turned upward, with the small ends of the branches pointing outward to the right and left, and the heavy end pointing straight in front of the operator. Of course, this heavy end of the twig is very sensitive to any downward force. A quarter of an ounce weight makes it bend from this horizontal to a vertical position. It is claimed by those who believe in the device, that an electrical or magnetic force shoots up-

ward and outward in all directions from an underground stream of water, or bed of ore or mineral—such as coal, iron, silver, gold, etc.; and that if the operator possesses strong magnetic or electrical powers and qualities, these currents from the subterranean deposits will make the connection with the operator through the projecting butt-end of the twig, thus pulling it down toward the deposit. The best operators claim to be able to tell the depth of the vein by noting carefully the angle or dip of the rod, as it is approaching the vertical location from either side, thus ascertaining its exact depth by a kind of mental triangulation.

But the reader may ask, is it really possible that intelligent men in America can be found who believe that the divining rod will act at all by the magnetic influence of such underground streams or deposits? We answer, Yes; thousands of them. We have now in our possession a book of nearly a hundred pages, ably written by Charles Latimer, Esq., a quite prominent civil and mechanical engineer of Cleveland, Ohio, in defense of the Divining Rod, and filled with the most positive testimony of eye witnesses in support of the truthfulness of the claims concerning its wonderful efficacy. As proof of Mr. Latimer's intelligence, he is a regular subscriber and reader of *THE MICROCOSM*. We are now in personal correspondence with him on this subject, and have a long paper from his pen (three times too long to publish) containing detailed accounts of his remarkable exploits with this instrument, and filled with testimonies in addition to those in his book from eminent engineers in proof of the practical working of the occult device. He is also a prominent Christian and worker in the Y. M. C. A., respected by every body who knows him, and hence it is not reasonable or fair to doubt his honesty, whatever we may conclude as to the actual character of the divinations that are claimed to be produced through the instrumentality of himself and his baguette.

But not to keep the reader in suspense as to our own views upon the subject, we unhesitatingly pronounce the whole thing, after reading all the testimony in its favor, an unintentional but unmitigated fraud on the community, though evidently a self-deception, so far as Mr. Latimer himself is concerned. We know this frank statement will hurt the feelings of a good and earnest friend of *THE MICROCOSM*, but we do not believe it will cause him to discontinue taking the magazine—since it is a hundred times more to his interest to read it than would the withdrawal of the paltry dollar he pays for it, be to us. Hence our duty as an impartial journal-

ist forces us to be honest with our readers, even if it were necessary to sacrifice a hundred personal friends in so doing. But we do not simply denounce this whole business of "dowsing" or "water-witching" as a fraud upon the world, even in the face of the positive testimony of scores of eye-witnesses; we propose to show reasons for such denunciation that will come home with force to Mr. Latimer, and to all who have borne testimony to his achievements. That he found the "witch-hazel coal-mines" by the indication of his rod, or by his imaginings concerning it, or that he pointed out the location of the water-pipes in the streets of Cleveland to the satisfaction of Mr. Whitelaw, the chief engineer of the water works, we will not dispute; but we here deny that they were anything more than lucky coincidences combined with engineering knowledge which unconsciously came into play to assist the rod's motion. Does the reader ask what it is that makes the rod dip when the operator passes over these water-pipes, coal-beds, etc.? We answer that it is caused by the twist of the wrist, combined with a peculiar turn and grip of the hand. But this, as just admitted, is no doubt often done by the operator unconsciously, at least to some degree, when he has a strong mental impression that he is approaching the right spot of ground. We have carefully and repeatedly watched this operation by persons who, we think, were honest in a way, and who really thought that they in no wise assisted the rod in making its dip. Yet we could distinctly see a movement of the muscles of the arms, wrists and hands that we were positive, whether the operator knew it or not, was the real cause of the rod's dipping, and that the pretended magnetic or electric currents from a subterranean water-course had nothing to do with it. It was literally, to use a common remark, "all in their eye." The appearance of the ground seemed favorable, then a strong imagination acting on the muscles of the arms caused the rod to bend. We have ourself taken such a rod and manipulated it in the same manner so as to hide the real muscular cause of the movement, and have thus deceived lookers-on into believing us a veritable "dowser."

But is it possible, the reader asks, that Mr. Charles Latimer is thus self-duped? Is it possible that an engineer of such ability could allow himself to think that he was under the control of some invisible force or current from the ground, aside from gravity, which actually draws that rod downward, and that the involuntary muscular twist of his arms has nothing to do with it? We have either to believe this to be a fact (that he is self-deceived), or that he is wil-

fully deceiving the people, or else that this water-witching business is true to the letter just as he represents it. The latter two alternatives we cannot believe; hence, we must believe the first one.

In the first place common sense ought to tell us that a small stream of water far below the surface would not so act on the pronged twig, because the whole adjacent ground is charged with moisture and contains probably, above and on all sides of the stream sought after, a hundred times more water than the little channel itself which the switch is supposed to indicate. Why, in reason's name, does not the rod bend to the hundred times greater quantity of water distributed in the surrounding earth instead of indicating the insignificant vein far below the larger quantity? To prove that Mr. Latimer really claims practically to discover such hidden streams and beds of mineral by the aid of the divining-rod, and insists that there is no fraud or self-deception about the practice, we cannot do better than to quote here what he and others have published in the *Cleveland papers* on the subject. In fact we have room to quote only a small fraction of what is constantly going through the columns of the press. These articles have been sent to us frequently by our subscribers with urgent requests that we give the matter attention in *THE MICROCOSM*—claiming that if the thing be true it is of the greatest importance to the world to let it be widely known, and if false that it should be exposed. So say we. We therefore first give our readers the benefit of these published statements, after which we will endeavor to squelch the whole "dowsing" business by the ordeal of simple tests that even Mr. Latimer cannot evade or gainsay. Here, then, are the reports from the *Cleveland Leader*. Mr. Latimer says:—

"The divining rod is only another exemplification of the existence of a power not yet recognized. With a piece of witch hazel I discovered the coal mines which bear that name. I told the number of feet a shaft would have to be sunk in order to reach the coal, and even gave the thickness of the vein. Yet people say there is nothing in it, and that the divining-rod is a superstition. If I have an idea that brings me in money, then the public pronounce it a good one. Money is the foundation upon which people base their declarations. I got \$5,000 for locating the Witch-Hazel mines, and am paid besides 12½ cents for every ton of coal taken out of them. Superintendent Whitelaw, of the waterworks, did not credit my ability to locate water pipes. He came to my residence one evening, and I went with him through several streets, and with the aid of the divining rod told him exactly where the pipes were located. I offered to make a map of all the pipes in the city, giving their connections and branches. Finally he asked me to go with him to the

Public Square. I traced several pipes for him there. When he asked me to find the big one, I not only found it, but told him how far it was below the surface of the earth. I have a letter in my possession from Mr. Whitelaw verifying my experiment.

"I once went to the residence of a noted scientist in Philadelphia where I made another test of the power of the divining rod. I walked across his library floor and traced a pipe. He said I was mistaken, as there were no pipes of any description beneath the floor. I insisted that there was one at least, and told him I should be compelled to leave his house with the firm conviction, that he was wrong and I right. Finally he made an examination in the cellar beneath and discovered a tin pipe fifteen inches beneath the floor, the existence of which he had forgotten."

The editor of the *Leader* then goes on to comment as follows:—

"Notwithstanding all that has been said and all the convincing evidence that has been adduced for years as to the wonderful action of the divining-rod, there are people who scoff at the idea and are skeptical as to the virtues of the same. Those who laugh at the properties claimed for the divining-rod, perhaps have a small modicum of the characteristics that caused some of the highly respected forefathers to pronounce as witch or wizard any one who did things which they could not understand. Some newspapers have copied extensively from the articles recently published in the *Leader* regarding the power displayed by Mr. Latimer with the rod. They not only scoff at the thought of such a thing, but some have gone so far as to brand Mr. Latimer as a crank. Those who know the gentleman intimately, or even casually, are the last ones to assert that he is a crank, even while they may be skeptical regarding the use of the rod. Mr. Latimer ranks among the finest civil engineers in the country, and is a thorough Christian gentleman in every respect. With a view to finding out the opinions of others who have seen Mr. Latimer operate with the rod, a representative of the *Leader* yesterday called at the office of John R. Whitelaw, superintendent of the waterworks:—

"I confess that I used to be very skeptical myself regarding the divining-rod, and I have frequently twitted Mr. Latimer about it. He had always laughed good-naturedly at my expressions of doubt, and remarked that sometime he would convince me," said Mr. Whitelaw, when questioned. "I had of course, heard of the powers claimed for the rod, but had never given the matter a great deal of thought. In fact, it being something that I could not understand, I was loath to believe it. I am convinced now, however, that there is something in it; and I believe that it is simply a scientific principle, that can be worked by any one who has a sufficient amount of electric force in his organism. But I will tell you what so thoroughly convinced me. Some evenings since Mr. Latimer, my son, and myself started out on the street to test the power of the rod, or rather of the operation. We proceeded over a part of the city in which I knew Mr. Latimer could not be acquainted with the location of water mains,

I did not take this precaution through any suspicion that he would take advantage of any knowledge that he might possibly possess regarding the location of mains, for I consider him one of the most conscientious men in the world; but I did so almost unconsciously. Well, we proceeded along the sidewalk, and he would locate cross pipes and pipes that led into houses where there was not a water plug in sight to indicate the locality of them. He procures a pronged stick, which must be of green wood, and grasps it firmly in his hands with the palms up. When he comes near metal or water, the butt end of the stick begins to turn slowly downward, and when immediate over the substance, it will point directly down to the ground, regardless of how tight he may grasp the prongs. "The rod, as it is called, is about this shape," and Mr. Whitelaw drew a diagram.

"The most severe test I gave him," continued Mr. Whitelaw, "was in the square. There is a twenty-inch main running diagonally across the south side of the square, from near the Forest City House, in a south-easterly direction, coming out at the south-east corner into Euclid avenue. I don't think there are ten persons outside of this office who know of the location of this main. As we started into the square, I said to Mr. Latimer, 'You know we have no mains in the park, but I wish you would hold the rod as we walk through here and see if there is anything.' He did so, and as we approached the main I could see him tightly grasp the prongs, as it started to turn slowly downward. 'There is something here,' he said; and when he came directly over the main the butt of the rod pointed down to it. The main was not only exactly located, but he told me the depth at which I would find it, as well as I knew it myself. * * * At another time myself and family were with Mr. Latimer at Geauga Lake, and we were anxious to have him show the rod there. After he had cut one, I asked him to go over a little stream of water that we saw running from the bank. We knew that the water was there, and we wanted to see if the rod would work over it. It was surprising. He held the prongs so firmly in his hands, and it turned so stubbornly downward, that the green bark twisted off in his palms. I could want no more convincing proof. The engineer who took us there then tried it, and it worked just as well with him. In my son's hands it only moved slightly, while in my own it would not move at all. Any one may call him a crank on this subject who chooses to; but although I was as unbelieving as the most skeptical, I am now most thoroughly convinced that there is truth in it."

"What in your opinion is the philosophy of it?"

"Electricity is my only explanation. I think that any man can work it successfully whether he is possessed of extraordinary brain power or not; but I think he must be a whole electric battery to do it, or rather a reservoir of electricity. Of course in calculating the number of feet at which the substance is buried and the quality and quantity of the material, whatever it may be, I believe comes from experience, mental power and mathematical calculation. You are perhaps aware that Mr. Latimer will

use none of the money obtained by the use of this science for himself. Whatever he obtains by it, he turns over to some charity. He has remarked to me that he did not believe in using a gift God had given him for personal gain. The money he receives from the coal mines that have been located by him, all goes to some useful charity."

"One of the gentlemen interested in the Witch Hazel coal mine, that was located by Mr. Latimer, an account of which was published in the *Leader*, said yesterday: 'There is no use talking. I believe that the use of the divining rod is a science, and one that can be cultivated, to what extent time only will show. When I heard that Mr. Latimer was going to endeavor to locate the mine, I laughed at the idea as absurd, and called those who told me of it a lot of superstitious cranks. The result proved that I was the crank, if there was any crank,' &c.

Now we shall not stop to comment with more than a remark on the apparent absurdity of a scientific man like Mr. Whitelaw, becoming convinced of the truth of water-witching by one of "the finest civil engineers in the country" simply pointing out the location of the water pipes in a well-constructed water-system of a city, with which he might be well acquainted. Indeed, such an engineer ought to go into any American city without his *baguette*, and name the location of every important water pipe in the streets, if the city's hydraulic system had been properly engineered. We only take it upon us to say here that there is not one particle of scientific perspicacity or depth about Mr. Whitelaw, or he could have devised tests and experiments that would have settled with absolute certainty the truth or falsity of Mr. Latimer's claims; and the fact that he did not do so is proof positive that, however capable he may be of engineering the water-works of a city, he is wholly unfit to report upon any pretended new discovery in science or philosophy. Such superficial and incompetent witnesses as Mr. Whitelaw, are the very classes of men who have reported upon the wonderful achievements of Slade, Phillips, Foster, and other performing spiritualists, and have pronounced their legerdemain tricks genuine, thus helping to lead millions into believing in the fraudulent humbuggery of modern spiritualism. As Captain Carter said in a recent article, not one man in a thousand, even of educated scientists, is fit to sit in judgment upon such occult claims as those of Mr. Latimer, or anything else in the scientific line, out of the ordinary run of things. We could write out in a single hour a dozen tests for Mr. Latimer to submit to, any one of which would settle, beyond all doubt, either the truth of his pretensions to possessing one of the most important discoveries the world has ever known, or else instantly squelch one of

"the finest civil engineers in the country" as a self-duped humbug. We have only time and space here to state two of these tests for the benefit of whom it may concern:—1. Suppose Mr. Whitelaw, when he took Mr. Latimer into the park, had blindfolded him and led him over the ground in various directions, circuitously, diagonally, and criss-cross, with the rod in his hand, and suppose under such circumstances, without a word spoken or sign given, the rod would have dipped each time the water-pipe was crossed, there being no ridge or irregularity in the surface of the ground to indicate it; plainly, such a test would have amounted to something. But such a crucial and simple test naturally never entered the superficial brain of the chief engineer of the Cleveland water-works. If Mr. Latimer would be willing to submit to such a test as this, and if every time he crossed the main his *baguette* should dip at the exact spot, he could easily make for charitable purposes fifty times the amount he received for guessing the location of the Witch-Hazel mine. We would rather have such a supernatural phenomenon for a public exhibition as a money-making venture than Barnum's "Greatest Show on Earth." Come, Brother Latimer, if your pretention is sound, and you can stand the ordeal of a real scientific test, "there's millions in it." What say you?

2. But here is a still better test of the truth or falsity of this water-witching claim. If Mr. Latimer does not in any way assist the butt-end of the pronged twig to dip by the turn of his wrists or the grip of his fingers, then let the two twigs be clamped directly in front of his hands between fixed blocks of glass or any other insulating material that will not interfere with the electric current passing through the rod to his arms, and then let these clamps be secured to a stake firmly driven into the ground. Now pass under the heavy end of this projecting rod, thus secure against the muscular aid of Mr. Latimer's wrists, a pipe conveying water, or a cart-load of coal, or anything else, and if the rod dips one iota from the influence of either (let him grip and twist as he may), we will immediately send, poor as we are, a check for \$100 to add to Mr. Latimer's charities. With indubitable evidence of such dip of the rod in the slightest degree we should consider that we had obtained the cheapest hundred dollars' worth of important scientific knowledge ever bought in a philosophical market.

We now appeal to the *Cleveland Leader*, and other papers there and elsewhere, to stop this superficial puffing of the wonderful achievements of the divining-rod on the testimony of

such shallow experts as Mr. Whitelaw, and join THE MICROCOSM in demanding one or both of the foregoing tests under such surveillance and watchfulness as will preclude the possibility of collusion or self-deception. We are not the one to pooh! pooh! any claim to a revolutionary discovery in science because it happens to be new or astonishing, if it can only be sustained by irrefragable evidence. But we are just the one to demand indubitable proof of the correctness of claimed results in scientific research before subscribing to them. We have done this with advocates of the wave-theory of sound, and we now make the same demand upon believers in the divining-rod.

In conclusion we are perfectly willing that Mr. Latimer should call us a "scientific charlatan" and bigot for not accepting the testimony of scores of reputable witnesses such as Mr. Whitelaw. But these charges amount to nothing so long as it remains a fact, as just pointed out, that not one of these witnesses had the scientific judgment or forethought or courage to demand and insist upon tests that would satisfy a reasonable scientific mind. Whenever these tests shall be willingly submitted to by Mr. Latimer, the ordeal be successfully passed, and the result amply verified by competent experts, THE MICROCOSM will not hesitate to surrender—mysterious and inexplicable as the phenomena may still prove to be.

MISSIONARIES OF SUBSTANTIALISM.

Some time ago, during the preceding volume of THE MICROCOSM, we called attention to the above-named subject. A number of young men, who had become thoroughly convinced of the general truth and broad application of the Substantial Philosophy, had intimated a willingness and even desire to take the field as lecturers upon that theme, and thus endeavor to impress its great truths and principles upon the public mind. In our remarks we approved of the proposition, and suggested that those who thus undertook the work could add to the value of their missionary labors by getting as many as possible to become regular readers of THE MICROCOSM—the only outspoken and admitted organ of Substantialism. Several young ministers, as we learn, are now preparing a course of lectures upon this theme to be delivered in different towns and cities throughout the country. One, especially, Prof. J. T. Cropper, of Clinton, Mo., writes us that he is ready to commence this work, and expects to take the field permanently in advocacy of these principles, and to devote himself to them as his life-labor. He says, in reply to our letter:—

"I regret that you cannot make a tour through the South and West to lecture on Substantialism, and the assurance drawn from the new Philosophy of a future state of existence for humanity. Thousands of people in the towns and cities where THE MICROCOSM is read would be

delighted to hear you upon that pregnant theme, But it is better that they should not hear your voice than that THE MICROCOSM should flag in the least. Let them read and study that magazine, as the text-book of Substantialism, and as the next best thing to hearing you personally, and they cannot fail to derive benefit. I am a thorough convert to your new Philosophy. I believe you are right; and that it is either *Substantialism*, as you set it forth, or there is no future state or personal conscious existence for man after death. So fully am I convinced of the truth of this, and of the importance of making known such a revolutionary doctrine—a philosophy so well calculated to benefit the world and advance the Church—that I propose as soon as possible to take the field for Substantialism, and to deliver lectures through this State, Illinois, Indiana, Ohio and Kentucky, and at the same time get as many as possible to subscribe for THE MICROCOSM."

In another letter he says:—

"I do not like the old method of preaching, of advocating one creed by pointing out the differences between it and others. I believe firmly that no religious or denominational creed amounts to anything worth wasting the people's time to discuss, if Substantialism be not true. It is the only principle of philosophy or religion that reaches to the bottom of things. It goes down to the very bed-rock of science and revelation, and if Substantialism be not true then materialism must be. From this conclusion I see no possible escape. With Substantialism false, the last hope of the Christian Church falls to the ground. The truth of immortality, as well as of the existence of God, rests upon the pedestal which you have dug deep and founded upon a scientific rock that time cannot moulder and fire cannot melt. So firmly do I hold this view that were it possible for Substantialism to fall in the battle you are now fighting, I should follow it to its grave as a disconsolate mourner, and bathe its tomb in tears. But it cannot be killed till a substantial God can be plucked from His throne."

From what we have learned of Professor Cropper, as a scholar and public lecturer, from those who have heard him, we feel sure that he has chosen the right field of labor; and that, while he will undoubtedly sustain himself in the work, we believe that the thousands who may listen to him will gladly receive the word. Let others go and do likewise, and we will take pleasure in announcing their programmes as soon as decided upon.

We also are gratified to mention that our very able and versatile contributor, Professor Lowber, of Lancaster, Ky., proposes soon to become another of the missionaries of Substantialism. He writes us as follows:

"My convictions are decidedly with the substantial Philosophy. After writing three more articles for THE MICROCOSM I shall prepare a lecture on Substantialism, and give it a prominent place among my other lectures this Winter. It will be of interest to show the harmony of Science with the grand truths of Revelation. No man appreciates your work as a Christian philosopher more than I do, and the bearing of Substantialism upon immortality and eternal life impresses me as no other philosophy ever has done."

In another letter, received more recently, he adds:—

"I have read the November number of THE MICROCOSM with a great deal of pleasure. '*Substantialism Evolved*' is the best article I have ever read on any subject. The more I study this Philosophy the more beauty and harmony I see in it," &c.

We are glad to learn as we go to press that other recruits are signaling their readiness to enter the Substantial lecture field. In our judgment no employment is more ennobling for an educated young man, or better calculated to help him forward in making his mark as a man of influence upon those who think, than a judicious adoption of the lecture platform as a life-profession. But in choosing such course let him be careful that the themes selected for his lectures are not only broadly beneficial to the world, but that they are unpartisan, unsectarian, and so clearly for the good of all classes, that no factious opposition need be aroused in an audience composed of all shades of belief in science and religion. We confess that we know of no possible theme so completely filling this bill as that of Substantialism. It is as broad as the universe, as susceptible of demonstration as mathematics itself, and as revolutionary as it is true. What more suitable theme, then, could form the basis of a lecture tour, for an intelligent student of science and theology than this radical, but catholic philosophy?

We are gratified at the information that the elementary principles of this new philosophy are becoming deeply embedded in the minds of so many independent investigators, and that they are coming to be viewed as constituting the very bulwark of religion itself, as well as of all true scientific and philosophical knowledge. Indeed, so rapidly is this all-permeating principle taking root with young scientific professors, and especially ministers of the various denominations, that it is becoming quite common to note the weaving of Substantialism into the webs of many of the popular sermons of the day, where only dry theological disquisitions had heretofore served as opiates for the congregations. What a change! Now the scientific thinker has come to be an attendant upon service, and has something to listen to that gives point and force to scriptural texts. Now the philosophical man of the world, but profound reasoner nevertheless, learns from the pulpit that there is more real substance in heaven and earth than had ever been dreamt of in his philosophy. Now the staid investigator of physics hears for the first time in his life that substance is of two kinds, material and immaterial, corporeal and incorporeal, tangible and intangible; and that the immaterial substances of Nature are even more real and important than are the material—constituting as they do, the vital principles and moving forces by which animate and inanimate Nature is manipulated. This one single substantial classification, lying as it does at the very base of the new philosophy, opens to the mind of the true physicist a new field of scientific exploration that his laboratory had never suggested much less revealed, and prepares him, instead of recognizing only gross matter, to see within it by aid of his mental microscope many concomitant substances as really entita-

tive as is the material body itself, and which in the end leads the thoughtful mind through material Nature up to Nature's God. This consummation, so devoutly to be wished by every Christian heart, is the fundamental aim of the Substantial Philosophy. It was in this effort of the mind, in our original arguments upon the subject in the *Problem of Human Life*, and where we aimed to contest the ground with atheistic materialism and deduce from Nature the absolute existence of a substantial but immaterial God, that we first encountered the abstruse problems of the sound discussion, and by which we involved ourselves in the terrific controversy with professors of physical science that has since followed. That controversy, having culminated in our October reply to Prof. Stahr, by common consent, in favor of the Substantial philosophy concerning sound as opposed to the mere motion of air-particles, has virtually sealed the verdict in favor of the general truth of Substantialism and at the same time has sealed the doom of materialism, leaving the other forces of Nature, or so-called modes of motion, free to fall into the substantial ranks and assert their rights as entitative realities in the economy of God's universe. No wonder that the untrameled minds of young theological and scientific investigators see new fields opened for cultivation upon this broad and fertile plain of Substantialism! Even the small patches of this vast domain that have experienced the cultivating influences of the microcosmic hoe and harrow are already whitening for the reapers, and some golden sheaves have already been garnered in the shape of honest converts from Darwinism and atheistic materialism, as we have had the pleasure of recording. But this foretaste is only a premonition of the great gathering of sheaves that will be witnessed when the churches with one accord come to adopt as the central article of their religious and philosophical faith this universal, this catholic tenet of Substantialism, upon which all shades of religious faith may unite "The field" will then literally be "the world," and the reapers as well as the sowers will be God's ministers. Then will be witnessed for the first time, at least in recent history, an ingathering to the folds of Christian worship of men of science, men of philosophy, men of the schools. Why not? Let these learned investigators of the mysteries of Nature find out, as they will then learn, that Christianity is a substantial, theistic philosophy as well as a divinely ordained religion, with a real, substantial, and personal though spiritual Saviour at its head and, who is of "one substance" with an entitative God His Father, who has prepared substantial mansions for those who follow His standard; and let them then learn that all this is in perfect keeping with the true principles of physical science, as first unfolded in Substantialism, and what is to hinder any cultivated, scientific thinker and investigator from espousing a cause which is thus in strict harmony with God's teachings both in Nature and Revelation?

Forty years ago, when trying to preach religious truth in our humble way, we wondered why so few of the wise, and great, and learned were called. We feared, though we scarcely

dared to hsp it, that Christianity, in some way, was not adapted to the scientific mind, or to those who had studied deeply into the problems of physical philosophy. But we now see that we were then terribly in the dark, as are thousands of other ministers at the present time. We only needed then, what we now rejoice in possessing—the glorious light of Substantialism—to place Christianity within the easy grasp of the philosophical mind no less than within that of the peasant. Without this light, we then plodded on for ten years of our life in a discouraging contest with infidel scientists, till we had quite nearly worn out our lungs with an almost fruitless effort to convince them; whereas, had we then known what we now know, of the true substantial philosophy of God's natural and revealed truth, we could have done much less talking while realizing a thousand per cent. more as a reward for our labor, in the intelligent conversion of thoughtful men. If any young minister of the Gospel doubts, let him panoply himself in a mail of Substantialism, master its magnificent philosophy, take the field, and then go forth to conquer.

CAPT. CARTER'S REPORT.

DEAR DR. HALL:—According to my promise, as printed in the November Microcosm, I now proceed to give you my Report of experiments on the slow motion of a turning-fork's prongs, in confirmation of your "finishing demonstration" as given in reply to Prof. Stahr, in the October Microcosm. The following are the results of my experiments:—

I used a large Koenig fork of 256 vibrations. Striking it heavily and holding it upright in my fingers, I found that its sound was clearly audible (either held to the ear or through a long, rubber tube,) at the end of *four minutes*. By means of a finely graduated scale I easily measured the amplitude of the fork's swing. I found it to be at first $\frac{1}{8}$ ($\frac{1}{16}$) of an inch. At the end of fifteen seconds it had reduced to $\frac{1}{16}$ of an inch amplitude. At the end of fifteen seconds more, its motion was barely visible against the sky. Now I can easily see a line of $\frac{1}{32}$ of an inch in breadth, which proves that the amplitude had again diminished to one-fourth. In the third fifteen seconds, the motion had become totally invisible, even through a good magnifier. Safe to assume another fourth, or a reduction of amplitude to $\frac{1}{64}$ of an inch for each swing.

Now there are sixteen times fifteen seconds in four minutes, hence I have the $\frac{1}{4}$ of an inch swing reduced by four as a divisor, sixteen times, or in round numbers to $\frac{1}{64000}$ of an inch at each swing. As the prong swings through this amplitude, counting both directions, 512 times in a second, we have the entire distance the prong travels, while still sounding audibly, but the $\frac{1}{128000}$ of an inch in a second. There are in round numbers 31,500,000 seconds in a year. Hence the prong moves at the rate of only about *one inch in four years!* Allowing one-half for the swifter travel of the prong at the centre as compared with its average travel throughout a swing, and we have the astounding fact that the fork continues to produce audible sound *while its prongs, at their swiftest motion, are not trav-*

elling at a velocity of more than one inch in two years! As your demonstration or brought down the prong's swiftest travel w^l still sounding to one inch in three hour have, therefore, made the proof more tl 5,000 times stronger against the wave-theo. than you had it, instead of 400 times, as I promised last month. Let physicists dispose of these figures if they can, or forever after hold their peace. Yours, for the truth,

R. KELSO CARTER.

REMARKS ON THE FOREGOING.

We sincerely thank our excellent contributor, Captain Carter, for his efficient aid in carrying out our demonstration against the wave-theory to its legitimate result, by means of his superior fork and his mathematical skill. Think of the astonishing fact of a fork sounding audibly when the swiftest travel of its prongs is only at a velocity of *one inch in two years*, and then compare this with the well-known teaching of the text-books. As proof that this demonstration leaves the wave-theory hopelessly broken down and crushed, we simply quote the following from Professor Tyndall's great text-book which is a standard authority on acoustics in all colleges:—

"Imagine one of the prongs of the vibrating fork *swiftly advancing*. It compresses the air immediately in front of it, and when it retreats it leaves a *partial vacuum* behind, the process being repeated at every subsequent advance and retreat. The *whole function* of the tuning-fork is to *curve the air into these condensations and rarefactions*."—*Lectures on Sound*, p. 62.

Professor Helmholtz, the highest living authority on acoustics, maintains the same view; and insists in various ways, that the vibrating prong or string must pass swiftly through the air, in order to condense it and send off air-waves. Here is a specimen of his teaching:—

"The pendulum swings from right to left with a uniform motion. . . . Near to either end of its path it moves slowly, and in the middle *fast*. Among sonorous bodies which move in the same way, only *very much faster*, we may mention *tuning-forks*."—*Sensations of Tone*, p. 28.

How laughable and preposterous all this now appears after reading the startling facts as arrayed in Capt. Carter's Report!

We now earnestly ask every candid student of science to examine this unavoidable teaching of the wave-theory in the light of the absolute facts here developed that the prong instead of "*swiftly advancing*," sounds audibly *when moving more than 25,000 times slower than the hour-hand of a family clock, and more than 300,000,000 times slower than any clock-pendulum ever constructed, instead of "very much faster," as Helmholtz teaches!* When the student shall have duly reflected upon this startling state of facts, let him then consider the humiliating predicament in which acoustical writers and professors involve themselves by still adhering to the impracticable necessities of their theory of "atmospheric condensations and rarefactions" as the true cause of sound-propagation. We further ask as a favor that every friend of THE MICROCOSM and of true science will take it upon himself to call the attention of his scientific friends, especially teachers, to this disastrous Report by Capt.

Carter. Surely with such an overwhelming demonstration as this against the truth of a theory of science, such theory ought not longer to bear sway over the minds of intelligent teachers in our colleges and universities, nor be longer taught as true science to the perversion of the minds of young students. Plainly, unless such professors are desirous of passing down to posterity as stupidly incompetent to teach science, or else stubbornly dishonest in clinging to an exploded theory, let them at once either answer this demonstration or abandon the present theory of acoustics as a fallacy of science. Biography and impartial history, depend upon it, will make no allowance or excuse for a professor of science or author of a scientific treatise who shall willfully shut his eyes to such a demonstration as this.

THE EARTHQUAKE AT JAVA.

THORP SPRING, TEX., Oct. 15, 1883.

EDITOR MICROCOSM:—Just north of El Paso, Texas, there is a bold and picturesque mountain. On the day of the Java disaster, a gentleman on the mountain heard rumblings in its recesses, and felt a number of severe shocks. On the same day, about noon, repeated noises were heard in all parts of Texas resembling the firing of artillery. The sounds appeared to be in a northerly or north-easterly direction from those who heard them. Myself and son were travelling in Hood county, and, nooning by the road-side, we heard the sounds very distinctly and repeatedly.

I. A. CLARK.

REPLY TO THE FOREGOING.

We have no reason to doubt that the phenomena observed by Prof. Clark were the direct effects of the earthquake at Java. If the interior of our globe is a molten mass, as we assumed in our editorial on that subject in the May number of THE MICROCOSM (last volume), it is not impossible that lava waves, by such tremendous commotion might be driven half way round the inner surface of the earth's crust.

If, however, it be objected that liquid waves would hardly travel so far or with sufficient force to cause these artillery reports heard in Texas, then we may assume the additional phenomena of electrical discharges in the atmosphere of gasses that surrounds the liquid, fiery mass of the earth's interior, accompanied with reports similar to thunder-claps in our aerial regions, only on a larger scale. These electric disturbances could be easily generated by the tremendous collisions that must have taken place under Java in the breaking loose of the masses of the earth's crust, and these electric currents, seeking equilibrium could almost instantly dart around the earth in opposite directions and come together under Texas, or under Central America, where similar shocks were heard at the same time, thus causing those terrific peals of thunder which rumbled up through the earth's crust like smothered reports of artillery. Possibly those electric discharges will rationally account for the breaking loose, also, of other and distant masses of the earth's crust, causing smaller earthquakes soon after an original and distant disturbance takes place. If lightning can shiver a tree to splinters in our rare atmosphere, and send forth a terrific report at the same time, might not a

similar but more powerful electric discharge, conducted by the denser vapors surrounding the ocean of lava, strike a mass of the crust's inner surface almost ready to fall, and thus break it loose with an accompanying report, such as is often observed? Although in our original treatise upon the cause of earthquakes and accompanying phenomena, we did not include electric discharges and thunder-reports, we have by much reflection concluded that the initial dislodgement of loose masses of the earth's crust with the accompanying reports may be more rationally explained in this than in any other way. We reiterate, then, in a word, that the sounds and tremors heard and felt in Texas, at the time of the Java earthquake, were probably the result of electric discharges conducted from that distant side of the earth, striking projections under the Texan crust, breaking loose small fragments of its inner surface, and at the same time, generating thunder-claps that are heard as the sounds of distant artillery. Who can suggest a more reasonable explanation? If any one can, let him send it along.

DR. ROBERTS ON COLD AND HEAT.

A CASH-PRIZE OFFERED.

Our scientific readers will be no little surprised as well as interested in reading the first part of Dr. Roberts' able paper on "Cold and Heat" printed elsewhere. The radical departure he has made from the teachings of the text-books, in claiming *cold* to be a veritable *entity* or positive *force* of Nature, as much so as heat its opposite, is enough to make a conservative scientist shake his head in doubt. We have always held with the books on natural philosophy that *cold* was a mere *negation* or the *absence of heat* in various degrees, as *shadow* is the absence of *light*, or *silence* the absence of *sound*. But Dr. Roberts takes up all these propositions and illustrations, and grapples courageously with each. His arguments show the pen of the same master-hand which has already become so familiar to our readers. But is he right this time? That is the question which ought to be susceptible of absolute demonstration by some simple experiment which any one can comprehend and appreciate. We do not believe it possible that two such directly opposite views on a plain scientific proposition can remain long insusceptible of a fixed and absolute demonstration one way or the other. Who will first give us such a simple experiment in cold and heat as finally to settle this argument, either for or against the position of Dr. Roberts? We shall endeavor to bring our own inventive powers to bear upon the matter, and will give the result to the readers of THE MICROCOSM in the February number, after the two able papers of Dr. Roberts have been read and digested. In the meantime, to encourage such research as will lead to light on this cold subject, we will give \$10 cash to the *first one* who will mail us a description of any unquestioned experiment such as called for; and in addition we will make him a paid-up life subscriber to THE MICROCOSM. The experiment must be simple, and beyond all dispute. We believed and maintained the same state of

things in regard to *sound*—that is, if the wave-theory were not true that there must surely be some simple demonstration that would conclusively show it. We tried for several years to circumvent it without entire success, though we produced many arguments closely bordering on absolute demonstration. At last we had the good fortune to succeed in the task in our reply to Prof. Stahr, in the October MICROCOSM, as confirmed elsewhere in Capt. Carter's astounding Report. Now let experimenters go to work and settle the question of *cold*, either as a positive *force* of Nature or as merely the *negation of heat*, by as clear a demonstration as that on sound. In the mean time, Dr. Roberts will resume his series of papers on the "Laws of Mind" in the February number.

ANOTHER DESTRUCTIVE "SOUND-PULSE."

"CONFLUENCE, PA., OCT. 29.—A terrible disaster occurred near Brooks Tunnel, on the Baltimore and Ohio Railroad, yesterday morning at about 9 o'clock, resulting in the instant killing of five men. The railroad company has been strengthening and widening the tunnel, and some distance outside a magazine had been erected, in which was stored 1,200 pounds of dynamite to be used for blasting. At about the hour named a freight train had just passed through the tunnel, and was side-tracked to allow an overdue passenger train to pass. Four of the crew of the freight train walked back to the vicinity of the magazine, and were engaged in conversation with the watchman when the people living in the vicinity were startled by a terrible concussion. Houses for fifteen miles around were shaken to their foundations, and windows for a distance of seven miles were shattered. Horror stricken, the people ran from their houses; and upon investigation, it was found that the dynamite had exploded with fearful effect. Trees were uprooted, huge rocks were torn asunder, and telegraph poles for half a mile were prostrated. Nothing remained of the magazine, and the men who stood near it just before the explosion were missing. All must have been instantly killed. Portions of bodies—including legs, arms, hands, and heads, have been picked up half a mile distant—but so badly disfigured as to be unrecognizable. The name of only three of the victims are known, namely: Geo. Reynolds, the engineer; Tice, a brakeman; and Hammond, the watchman. The cause of the explosion is enveloped in mystery, and, as the five men who might have thrown some light on the accident are dead, it is probable that the cause will never be known. Not far from the scene a gun was found; and it is supposed that one of the victims discharged it, the concussion causing the dynamite to explode."

REMARKS ON THE FOREGOING.

According to Prof. Tyndall, and all the authorities on acoustics, the above-described disastrous effects resulted from the *sound* or *noise* of the explosion. No mistake about this. The reader has only to refer to Prof. Tyndall's description of the Magazine Explosion near the Village of Erith, (*Lectures on Sound*, page 23), as we quoted in the *Problem of Human Life* at page 105, to see that the death of these five men, torn to fragments, and

the destruction of buildings, and the uprooting of trees, were simply the result of a *very loud noise or intense sound*! Shame to the vaunted scientific knowledge of the nineteenth century, as well as to the men who persist in teaching it to young men in our colleges, unwilling to acknowledge the error even after it has been pointed out and demonstrated over and over again!

It must not be supposed here, that Prof. Tyndall is alone in being thus terribly misled by the wave-theory. All writers who have exhaustively treated the subject, teach the same preposterous nonsense; namely, that a mere noise will destroy buildings, and disintegrate men and animals, scattering their fragments over acres of ground. No one, up to the publication of the *Problem of Human Life* thought of questioning this worse than childish fallacy, though every child knows that the most terrific thunder-peal—the loudest sound known to man—will not break a pane of glass in the very building where the bolt strikes. Take the article on *Acoustics* in the *Encyclopedia Britannica*, written by the eminent English authority on sound—Prof. Leslie, who says:

“Thus the *noise* of the explosion of a powder-mill is heard, and often *dreadfully felt* at a great distance all around the scene of disaster.”

We have no doubt, if Prof. Tyndall or Prof. Leslie should fire off a musket and be kicked over by its recoil, they would seriously report that the “*noise*” of the gun did the business! Why not? Surely the kicking of the gun is caused by the instantaneously generated gas, the very thing which also destroys buildings; and if this real cause (gas), is to be ignored in one case, and the result attributed to the “noise,” it ought to be in the other.

Again we repeat; shame on such pretended science! Thank heaven, the light is beginning to dawn, and the fogs and mists of false teaching are beginning to disperse before the intensified rays of invincible truth. The fact that these five men were really torn to fragments by the enormous *gas wave* instantaneously generated by the exploding dynamite, and that the sound of the explosion, *per se* had nothing to do with it, is one of the simplest and most self-evident propositions in physics,—one which no child ought to dispute for a moment. Yet because we happened to be the first to announce it, and thus to correct this prodigious error of the physicists, we are silently tabooed in the meetings of the great scientific societies and associations as unworthy even of a passing notice. Well; we can stand it if they can. Time and history will tell the tale.

REV. DR. KAVANAUGH STILL NOT SATISFIED.

Our hopeful and ingenious contributor, Dr. Kavanaugh, the distinguished inventor of motor-powers for the different parts of our solar system other than gravitation, proposes again to come to the rescue of his favorite theory, which we so mildly criticised in the October MICROCOSM. We say—“Come on Macduff.” Make your arguments short and to the point, and if gravitation can be fairly supplanted by

electricity or anything else as the motor-power of the solar system we surely have no objection. But let it be done philosophically, scientifically, and logically. Make your story hang together if possible. We have no contributor that we esteem more highly than Dr. Kavanaugh, and we know of no one that begins to compare with him as an inventor of motor-powers,—not even Mr. Keely.

Possibly, however, a line to Dr. Kavanaugh from the profound mathematician and astronomer, Rev. Prof. S. B. Goodenow, might not do him any harm. The Professor writes us:

“You suggested in one of your letters, that I write something in reply to Dr. Kavanaugh. But you have given his theory such a complete demolition, that it is entirely unnecessary for me to write. I thank you for the vindication you have there made of “gravity and projection as abundantly sufficient for every such purpose” of explaining orbital motion. Your power in the keen, cutting disintegration and destruction of a false system, is well illustrated in that article.”

DR. WILLISTON'S FORTHCOMING BOOK,

Next month we hope to be able to give the Title of Dr. Williston's Book. Indeed we are becoming no little excited over the prospect of seeing it ourselves, and reading what we confidently expect to prove an intellectual treat of no mean order. And we suspect very strongly that this will be the feeling of readers of THE MICROCOSM who will carefully read the thoughtful, and even masterly, article from the author's pen, printed elsewhere in this number. That article, as we learn, is to form a small fraction of the book referred to; and if it is a fair sample of the entire work, then, verily there is in store something decidedly good for those fond of elegant and profound religio-philosophical argumentation—whether they may or may not agree fully with the writer's views. At all events let no reader miss the opportunity of examining the article referred to, commencing on page 130 of this number.

DARWINISM AS OTHERS SEE IT.

If not another argument had ever been written or published against the Darwinian theory of evolution by “natural selection and survival of the fittest,” the paper of Isaac Hoffer, Esq., printed elsewhere, ought to be sufficient to overturn it in the mind of every candid and logical adherent of that doctrine. Indeed we consider that argument a complete summary of the invincible points against the system, and we ask every honest believer in the possible transmutation of species by anything other than direct miraculous intervention to read and try to refute Mr. Hoffer's positions, before going further. We say emphatically, no man, in our judgment, can do it. In addition to this very able and conclusive paper against the doctrine, we will present next month a carefully written plea in favor of “Theistic Evolution,” as held by Joseph Cook, Dr. McCosh, Asa Gray, Henry Ward Beecher and others, communicated by a learned professor in one of our colleges, who has been forced, as he claims, by Mr. Darwin's arguments into that belief. We will also give, in the same number, our own reply to his arguments.

PROF. STAHR, AND THE REFORMED QUARTERLY.

Next month the January number of the *Reformed Quarterly Review* will appear. Our readers will recollect that in the October *Microcosm*, we peremptorily demanded of Professor Stahr that he answer in the January *Quarterly*, our "finishing demonstration" against the wave-theory based on the slow motion of the tuning fork while sounding, or else that he honestly and manfully acknowledge in said *Quarterly* that he had been mistaken in opposing the substantial philosophy. As a Christian minister and a professor of science in a leading college he must be aware that the readers of that *Quarterly* (many of whom, also read this magazine) look confidently to him to defend the current theory of acoustics, and either to answer our demonstration, or else surrender to the substantial view of sound. He may rest fully assured that the class of thinkers who read that *Review* and this magazine will hardly tolerate silence on his part. He made the issue boldly in the *Review*. Let him now stand up to it like a man, or acknowledge his error. Here are his words as they occur in the July *Quarterly*:

"The *slow motion* of a body in the air [by which he refers to our *fun's* motion, 7 feet in a second] *only displaces its particles, producing a temporary disturbance, but no air-wave or sound-wave. Rapid motion*, on the other hand, implies *impact, a stroke upon the particles with such velocity that they have no time to move aside or slide over each other!*"

"*No motion in the air unless it is sufficiently rapid to produce condensation and consequent rarefaction can ever produce sound.*" Page 318.

In the light of these quotations from his own carefully written article, let him read Captain Carter's *Report* elsewhere in this number in which our "demonstration" is more than confirmed by showing that the fork sounds audibly when its swiftest motion is less than at a velocity of *one inch in two years!* Such a fact is too startling to be ignored or treated with silent contempt. He must either face it and suffer the consequences, or sink utterly out of sight as a candid scientific investigator. And while upon this subject we must not let the opportunity pass of also reminding Dr Apple, the Editor of the *Reformed Quarterly*, that, as President of the College and as the responsible party in giving Professor Stahr's "Two-edged Sword" to the world it is his special duty to his readers and to the public to see that the Professor, either tries to break down our "demonstration" or else confesses his error as publicly as he committed it. As editor ourselves we sympathise deeply with Dr. Apple. But his duty is imperative, and he must not try to evade it.

PROF. I. L. KEPHART, A.M.

Our old reliable contributor, Prof. Kephart has accepted a professorship in the San Joaquin College at Woodbridge, Cal., and leaves for his new field of labor this month. We do not know whether to be glad or sorry. In fact, we are both,—glad to have him in a position where he can do more good to the world than in any other we know of, and sorry that he is still farther away from us and less immediately

accessible. Still we are pleased to announce that his relationship as contributor for *The Microcosm* will not be changed. We should be almost inconsolable should his new duties sever his relations to this magazine, and we know that our readers would fully sympathise with us in our loss.

DR. CRONIN TO DR. BOWIE.

We have received a pleasant reply to Dr. Bowie's defense of Hahnemann in last month's *Microcosm* from Dr. Cronin of Chicago. Our present number was more than full before it reached us, so it will have to go over to next month. Dr. Cronin, as a very high authority, makes an open confession of a medical secret which we have long suspected. It has a hopeful out-look for the increased longevity of the race when leading doctors will admit better results in general practice, from the use of bread-pills spiced with imagination, and good nursing, than from the heroic medicines of the day. Let us take courage.

JOSEPH COOK, A SUBSTANTIALIST.

Professor John T. Cropper, of Clinton, Mo., writes us that he had a conversation with the Rev. Joseph Cook, at the close of his lecture in that town recently, and that the great Boston lecturer declared himself unconditionally in favor of *Substantialism*. He went so far as to declare that Substantialism was not only true, but that it was "one of the seven wonders of the world." Ministers who have hesitated in receiving the new philosophy have here a noble example set them, by one of the foremost metaphysical thinkers in America, if not in the world. Bravo, for Joseph Cook and Substantialism!

THE TIDE-PROBLEM.

Our able contributor, J. R. Hoffer, Esq., Mt. Joy, Pa., suggests a difficulty in regard to the two simultaneous tides on opposite sides of the earth, and objects to the explanation as given by gravitationists, and as we presented it in reply to Dr. Kavanaugh in the October number of *The Microcosm*. Mr. Hoffer remarks:—

"You pointed out the untenable spots in Dr. Kavanaugh's electric theory of planetary motion; but your explanation of the tides by the gravity theory seems also to have vulnerable parts. You say the tide on the other side of the earth opposite the moon is caused by the "tendency of the moon to pull the solid earth from the mobile ocean." How could this *tendency* raise the water without pulling the earth away from it? And such a pulling asunder would leave a vacancy at the bottom of the ocean. Again if on the side towards the moon "attraction tends to pull the water away from the ocean's bottom," the ocean would also be lifted bodily from the earth on this side. This is good news for divers."

We think this difficulty can be successfully met and set aside by what we hold to be a new explanation—at all events one which we have never seen in print. No one can doubt the flexibility of the earth's crust, at least to some extent. This is abundantly proved by the observed effects of earthquakes in the undulatory movements of the ground, as if liquid waves

were rolling along a short distance below the surface. Of course this motion would be more easily produced in the ground at the bottom of the ocean, several miles nearer the molten lava beneath, than on dry land where the crust is thicker. It seems reasonable that the solid crust is much thinner below the ocean than below the surface of dry land, and consequently more flexible, proportionate to the ocean's depth. Now we can easily see that no perceptible effect, as a tide, would be produced by the moon's attraction upon the water, but for this yielding of the ocean's flexible bed. Then if we are right in our view of an interior molten globe, with partially vacant space between it and the solid crust, it becomes a simple process for the moon to pull or bend out the more flexible crust beneath the ocean, thus causing the tidal flow at the side nearest the moon. And if this is reasonable, it applies equally, and on the same principle to the opposite side of the earth as the true cause of the tide produced there at the same time. It is evident that the moon must also pull the thin crust under the antipodal ocean inward or toward the earth's centre, when pulling the crust on the other side outward; and as islands in the antipodal ocean are connected firmly to the ocean's bed, they would tend to sink slightly as the ocean nearer the shore would flow toward them. This effect agrees with the observed irregularities of antipodal tides in point of time, as between the shores and distant islands—the islands experiencing the direct effect of the moon's pull, while the shores get only the reflect flows. We thus entirely avoid the "vacancy" or vacuum difficulty at the bottom of the ocean on either side of the earth as supposed by our contributor.

As evidence that this flexibility of the earth's thinner crust beneath the ocean is an important factor in the problem of tides, we know that not the slightest tidal effect is observed in our large lakes, even Lake Superior. If the present theory of tides by the moon's attraction, as laid down in the text-books, be all there is of the solution, why is it that no observable effect is produced upon such a vast body of water as that of Lake Superior? There are two reasons for this on the new hypothesis here suggested, but no possible explanation, as we conceive, without it. Here are the reasons for the absence of tides in our great lakes. First, the lake does not compare in depth with the ocean, thus leaving the solid crust below the lake but a trifle thinner than that below dry ground, but several miles thicker than that below the bed of the deep ocean, and consequently the bed of the largest lake would not yield at all to the moon's pull. Second, if the lake were as deep as the ocean and the solid crust beneath it as thin as that beneath the ocean, still its very circumscribed area would neutralize its thinness and prevent its flexibility as compared with a greater expanse of thin crust. How plain! Hence, no tide is observed in the largest and deepest lakes, or even in small seas not connected by arms with the broader ocean; such tides observed in seas thus connected, coming from the ocean itself rather than caused by the moon's action upon the smaller body of water. We trust this *flexible* solution will prove suffi-

ciently inflexible to bear the strain of critical examination, and that it will relieve our contributor's mind of its "vacancy" at the bottom of the ocean, as well as aid science in the further solution of observed tidal phenomena. What says our critical and mathematical contributor, Professor Goodenow, to this solution? We name him in particular, as we confess we have learned to fear him as well as love him. Possibly he could throw light on this whole question, by a short and concise article on the Tides.

FROM THE PRISON TO THE THRONE.

We have neglected, because of over-crowding duties, to refer to the above named beautiful book of our excellent contributor, Dr. Van Dyke. Not having time to read it through ourself, we loaned it to a competent friend, who pronounces it the best, or at least one of the best books ever written. This accords entirely with our opinion of the portions we read. Indeed, Dr. Van Dyke can only write with excellence upon any question he touches—as our readers have had ample proofs in this magazine. The price of the book is one dollar. Address the author, Rev. Jos. S. Van Dyke, Cranbury, N. J.

COMMENDATIONS OF OUR WORK.

Some of our subscribers criticise, in a friendly suggestive way, our publication of the kindly notices so common in the press and from enthusiastic friends of *THE MICROCOSM* and *Problem of Human Life*. Others, on the contrary, express great satisfaction in reading such favorable notices of our work and the progress it is making. Now, as we desire to please all parties as nearly as possible, here is a notice, directly against us which we copy verbatim from the *Abilene* (Kansas) *Gazette*, written by the editor, V. P. Wilson:—

"We notice that our old "literary acquaintance," A. Wilford Hall—or as he used to sign his name, Alexander W. Hall, is still engaged in building "cob houses." He is great on assertion and wind. A man who claims that he has disproved and overthrown the scientific theories of Newton, Darwin, Tyndall, Huxley, Helmholtz, Hæckel and Mayer, as this man Hall, in his "*Problem of Human Life*," claims he has done, is either a modern miracle among men, or an egotistic charlatan—and we know him to be the latter in the field of polemic theology, if not in science. We would believe none of his statements simply on his own "say-so." He is trying to whip the brethren of his denomination into an acceptance of his "scientific" vagaries—but the more intelligent refuse to dance to his music—and the wave-theory rolls on undisturbed, by his small grain of sand, to any appreciable extent. Bombastic assertion and shallow egotism do not count with intelligent minds."

When we received the paper containing this notice we felt sure by the "flutter" that the writer was one of the "wounded birds." So we wrote to a subscriber living there, who clearly accounted for the lopped milk in that cracked coconut: "Mr. Wilson," he says, "is a Universalist preacher of the most pronounced kind." Of course *Universalism Against Itself* is what's the matter with Mr. Wilson, and all his subscribers know it. We are sorry the poor bird got hurt, but it must learn to keep out of

the way of our scattering shot. The last sentence of its piteous shriek is true to the letter, as any one can see by reading the *Gazette*.

A TELLING LITTLE PRESS-NOTICE.

W. S. Furry, Esq., Editor of that commanding and wide-awake journal the *Columbus* (Ohio) *Herald*, commences a criticism of THE MICROCOSM in these words:—

[From the *Columbus* (O.) *Herald*.]

"We can say of 'WILFORD'S MICROCOSM' for November, what we can of few other publications, indeed, namely, that we have read every word in it from Col. John M. Patton's *exposé* of 'Foster's Spiritualism,' to the editor's little note on J. I. Swander's first article concerning the 'Mercersburg Philosophy,' and when we concluded, it was with a feeling of regret that there wasn't more to read. We wish to impress upon our readers the fact that the MICROCOSM is similar to no other publication in the United States or elsewhere. It is the organ, and so far the only organ, of an entirely new system of philosophy which found its first expression in Dr. A. Wilford Hall's wonderful book, '*The Problem of Human Life*,' and has been since gradually put into shape under the name of Substantialism."

When a busy editor of a great paper like the *Herald*, with hundreds of exchanges, can write like this about any one magazine, such magazine ought to be considered worth subscribing for at one dollar a year.

STEVENS INSTITUTE.

Professor Thurston, a colleague of Professor Mayer in Stevens Institute, Hoboken, N. J., was asked recently by a friend of THE MICROCOSM, why his folks did not reply to Hall's arguments against the wave-theory of sound? "Because," answered the Professor, "there is no use in answering him: those who believe in Hall can never be convinced that he is wrong."

Now we do not doubt that Professor Thurston is very nearly right as it relates to the wave-theory, since "those who believe in Hall" on that question have believed on demonstrative evidence that has come to stay. But there are thousands of readers of THE MICROCOSM who have as yet not subscribed to Hall, but are in a state of transition from the old dispensation of materialistic wave-motion to the new Philosophy of Substantialism. These thousands of professors and students of philosophy are learners with reference to this new dispensation of physical science, and while studying the arguments of THE MICROCOSM are anxiously waiting for Professors Mayer, Thurston, Tyndall, Helmholtz, &c., to come forward and refute these arguments, and at the same time furnish proof to sustain the old-theory, if such thing is possible. If there were none interested but "those who believe in Hall," there would be some sense and propriety in Professor Thurston's reply. Or has he come to the conclusion that the whole world has already become converts? Either this, or Professor Thurston knows that he dare not, with Professor Mayer to help him, even attempt to convince anybody,—readers of THE MICROCOSM or others,—that Hall is mistaken, lest in so attempting he should increase the number of converts to the Substantial Philosophy. We only ask an answer

to one single argument which we have presented against the wave-theory and, as already promised in these pages, we will publicly renounce Substantialism. That argument is the one embodied in our "finishing demonstration" in the October number, and as vastly extended and strengthened in Captain Carter's Report of experiments printed elsewhere. Professor Mayer is acknowledged to be an eminent and able physicist. If that "finishing demonstration" were really fallacious, he could in a single column of THE MICROCOSM pulverize it to powder and blow it away like chaff. Now Professor Mayer can have two pages of this magazine, not for one number only, but for a succession of numbers, to perform that simple achievement. Will he gratify the public by undertaking it? We pause for a reply. If no reply comes, readers of this article will have little difficulty in guessing the reason why.

STUDENTS FALLING INTO THE RANKS.

One evidence of the onward march of Substantialism is the fact that professors and students in colleges where THE MICROCOSM is taken and filed in the reading room, unwilling to await their turn, are sending their dollars for the third volume beginning with the first number, thus securing the work for preservation, reference, and careful study during leisure hours. About twenty students in one university have just formed a club and sent in their names at seventy-five cents each, being unwilling to be kept out of reading the latest scientific developments by their more fortunate fellows who happen to secure the first reading of the library copy. No student, and especially professor, should be without a full set of this magazine from the first number of Vol. I.

KIND WORDS NEVER DIE.

To fill out this corner we give a specimen of the kind words received in hundreds of letters:—

PROF. A. B. MOORE, of the Northern Ohio Normal College, at Mansfield, writes us:

"I shall await the coming of your text-book on Sound, and will hail it with pleasure. I teach the wave-theory of sound as a *theory* only, and have given my class the benefits of your discoveries, as being more consistent with observed facts."

REV. PROF. STEPHEN WOOD, Lost Nation, Iowa, writes:—

"Have just read the '*clincher*' on 'swiftly advancing,' in the light of Capt. Carter's Report. It is overwhelming. It must open the eyes of those who thought there was still hope for a possible reconstruction of the wave-theory. All hope is now gone. But don't let up on it till Tyndall & Co., are smoked out."

PROF. GEORGE YEAGER, A. M., of Philadelphia, Pa., writes:—

"I have no words in which to express the intensity of my conviction that the author of the *Problem of Human Life* will soon be regarded as one of the greatest, if not the greatest, Christian Scientists of this or any other age. The 'Let there be light' of Gen. I., is fulfilling even to this day; and there is light yet to come, still more effulgent than any we have yet seen. For fifteen years I have been engaged in studies that make the recent overwhelming proofs of substantialism in all its bearings especially valuable to me," etc.

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COLD AND HEAT.

(Concluded from last month.)

BY REV. J. W. ROBERTS.

But I fancy I know an advocate of the present system coming to its rescue on this wise:

"It is a well established principle of philosophy which cannot be successfully attacked, and in accordance with which all scientific investigations are conducted, that no two substances can occupy the same place at the same time; but if your theory is correct, heat and cold accomplish this very impossibility—because latent heat is found in all material substances."

I will reach that point in the investigation presently. In the meantime, I wish to propound a few questions, with their connecting antecedents.

Electricity exists in our atmosphere at all times in perfect harmony with the particles of air. The same may be said of odor, magnetism, light, heat, gravity; all these exist in harmony with the atmosphere, and in perfect accord among themselves. Are not these all substances? How do they exist together? Do the particles of each one push aside the particles of all the rest, and thus make room for themselves? It is supposed by some that this is the process of action, while others hold that the more subtle substances interpenetrate the particles of the others, and thus abide with them. So far as the discussion of the problem under consideration is concerned, it matters not which of these views is correct; the fact remains that in some mysterious manner these substances co-exist in harmony. Why, then, may not heat and cold do the same? Can any one give a logical and scientific answer in the negative?

"But heat and cold are so diametrically in opposition to each other, and their want of harmony is so manifest, how could it be possible for them to exist together in harmony."

How do you know they are any less in harmony than electricity and air, or air and light? And what has harmony to do with the matter anyhow? Another question also arises at this juncture. If heat and cold are so stubbornly opposed to each other, how does the harmless retirement of heat make room for the other? and why does it give way, with such placid grace, that so radical an opponent may take its place?

Now I reach the proposition left a few moments since. I do not for a moment claim that these two substances, heat and cold, occupy the same place at the same time. I say *substances*, because I conceive it impossible for any rational mind, whose attention is directly called to the fact, to hold that the astounding effects of cold can be produced by *nothing*.

I assume, then, what must be conceded, that here are two forces at work in the universe, and they often come in conflict, in fact they are all the time in conflict. How do they displace each other? I will take the bar of iron or steel for an illustration. It is possessed by

heat; but cold comes along, takes hold of the bar, drives out the particles of heat, and takes the place they occupied. When driven out, the particles of heat being exceedingly volatile, find a lodgment somewhere else. When the time comes, heat, being re-enforced, makes an attack upon the cold and drives it out, particle by particle, and resumes its old place, in possession of the bar. There is no limit to the repetition of this process. The same is true of every other thing in Nature that comes within the realm of these contending forces.

I am perfectly willing to pass this explanation of the phenomena of heat and cold to the calm consideration of both the scientific, and the common-sense world for scrutiny and criticism in contrast with the existing theory. It lucidly and logically explains *all* the phenomena under review, while the old system confessedly does not and cannot, because it is radically deficient. The objector says: "You forget that caloric, the latent principle of heat, is found in all substances, and that heat may only be compressed down into its original condition of caloric in the bar of iron or other substance, and not driven out as you suppose."

I forget nothing of this claim set up, although I may receive it with many grains of doubt; but, for the present, I am ready to grant as true all that is claimed for it in its length and breadth, and how does that help the case? Does it not require as much or more *force* to compress the particles of heat into so much smaller compass than they previously occupied, as it will to drive them out entirely without compression? Certainly. Compression of substances requires much more force than to move them, bulk for bulk, so far as we have the means of making tests. Nothing, therefore, is gained to the old system by this method of reasoning. Besides, it is self-stultifying; for it implies one of two propositions: Either that heat compresses itself back into caloric, or else that its mere negation captures it.

I may as well pause a moment here as anywhere, to consider the proposition that latent heat is contained in all bodies. While I do not positively assert to the contrary, and the determination of this question one way or the other will not affect my general hypothesis, yet I do not deem the proposition established. The fact that Sir Humphry Davy melted ice in a room below the freezing point, by simple friction, so much quoted and relied upon, is by no means satisfactory, for several reasons:

In the first place it may require a degree of cold very much below the freezing point to expel all particles of heat. In the second place, if the former requirement be not essential, it is evident that that gentleman was himself in the room, with his warm body, which was sending out particles of heat all the time; and the act of friction or rubbing the two pieces of ice together, the same being held in his hands, increased the heat, and the hands being good conductors of the same, the heat from his body was thus sufficient to produce the melting

of the ice. Where there is any latent heat, friction, of course, liberates some of it; but I deem it reasonable to conclude that the pieces of ice in Sir Humphry's hands could have been melted by friction under the circumstances, if at the commencement of the process not a particle of caloric was in the same.

To make a test perfectly satisfactory, let a room be reduced in cold down to zero, having in it iron arms worked by machinery outside, these arms to be at zero, and in some device to represent hands, two pieces of ice be placed in such a manner as to be brought into friction when the machinery is started. Set the arms going; and apprehend there will not be a drop of water produced, but that the ice will be pulverized into icewater; and if a ton of ice should be thus used up by friction, it would all be ice-water without a drop of water.

Let me now give an illustration, already alluded to, to show the tremendous force of cold. A couple of gallons of water placed inside of a solid globe of iron of considerable thickness, and exposed to such a degree of cold as will cause the water to solidly congeal, will exert such force upon the globe of iron as to rend it asunder. Has the same quantity of heat ever performed so great a feat of strength? Is this mighty exhibition of force a mere privation, a negation, a nonentity—nothing? They may believe it who can. I reject such a proposition as inconceivable.

I propose now to point out some of the fallacies which grow out of the existing theory concerning heat and cold.

It is claimed that there is no difference in the degree of heat existing in iron, stones, and flannel in a room of the same general temperature at any season of the year. Professor Wells in his *Natural Philosophy*, page 207 foot note, and elsewhere, thus states the case: "There can be no more fallacious means of estimating heat than by the touch. Thus, in the ordinary state of an apartment at any season of the year, the objects which are in it have all the same temperature, and yet to the touch they will feel warm and cold in different degrees. The metallic objects will be the coldest; stone and marble less so; wool still less; and carpeting and woolen objects will feel warm. Now these objects are at exactly the same temperature, as ascertained by the thermometer."

While the thermometer is the best instrument we have for measuring temperature, it is not perfect; and probably no two of them in the same room would register exactly the same degree of heat or cold, while the variations might be two degrees; but lacking perfection, the thermometer will approximate closely to the true general degree of temperature in the room. But the difficulty is here; the instrument cannot be brought into direct contact with the metal, the stone and wool, to register its tale of each one, but only records the mean of them all, as they are commingled in the atmosphere of the room. This is plain; and hence the thermometer is no test at all, in such a case, of the relative coldness or warmth of specific objects in a room, all of which have pooled their efforts, and these pooled results, as a unit, is all the instrument measures—not the separate condition of any one of the articles. In order to reach any correct estimate, it would

be necessary to have three thermometers of exactly the same register in the same temperature, and then encase one of these in the iron, one in the stone, and one in the wool, cutting all of them off from any other influence than that which proceeded from its own environment, and then see if they would make the same report.

I undertake to say that within certain limits there is no dead substance in existence equal to live tissue, cuticle and nerve for testing delicate shades of heat and cold; and this is just as reasonable as that substance permeated and endowed with life is more delicately sensitive than dead matter can be. So far, then, from the touch of the individual being less acute and accurate as to the degree of cold possessed by each article in the room than the thermometer, it is much more nicely adapted to that end. I make this proposition:

Any one who believes that the iron is no colder than the wool, can test the matter by making a bed upon the iron in a cold night, with iron for a covering. I will make my bed in the same room in wool. If the mercury is at zero, my friend in the iron will be dead in the morning; and I will come out of my wool bed fairly comfortable. The bed and covering in each case to be of the same thickness. Does any advocate of the old system have faith enough in it to make this test? I emphatically assert that the wool in that room is not as cold as the iron.

Now for the explanation. Here are the two forces, heat and cold, contending for the possession of each article. From one of these articles the heat is much more readily and thoroughly driven than from another, by the cold, and *vice versa*. As the cold can more easily dislodge its rival from metal than from other objects, that is the first article it conquers and possesses, and the others follow in succession until it comes to wool or woolen fabrics; and then it is doubtful if the heat is ever thoroughly expelled from these, at least in the temperate zone. All substances in Nature have a closer affinity for certain other substances than for the general mass, while for some they have much less than the average. These facts are amply sufficient to explain the reasonableness of the theory just advanced, and to show why one article in the same room will be colder than another. It would be entirely unreasonable and contrary to the analogies of Nature for it to be otherwise.

On page 208 of his *Philosophy* Prof. Wells says: "Neither theory (the mechanical or vibratory) will perfectly explain all the facts in relation to heat with which we are acquainted." And no other theory that does not recognize cold as a force will explain them. I will now permit Prof. Wells to show some of the inconsistencies (?) into which the reasonings of his theory lead him. On page 207, he says:

"If a tube nearly filled with water is held over a spirit lamp in such a manner as to direct the flame against the upper layers of the water, the water will be observed to boil at the top, but remain cool below. If quick-silver, on the contrary, be so tested, its lower layers will speedily become heated. The particles of mercury will communicate the heat to each other; but the particles of water will not do so.

A stone or marble hearth in any apartment feels colder to the feet than a woolen carpet or hearth rug, not because the one is hotter than the other, for both are really of the same temperature; but because the stone and marble are good conductors, and the woolen carpet and hearth rug very bad conductors."

Query: If both are really of the same temperature already, how can the conducting power cut any figure in the transaction? And if all substances show the same temperature, how is it that the water is cold and the mercury hot under precisely the same circumstances? The plea of good and bad conductors is certainly as good in one case as in another; and if so, one or the other horn of this dilemma must be abandoned.

I will state another fact: Place a piece of iron and a piece of flannel in a room of "exactly the same temperature," but with no roof over it. Let the sun on a hot day in midsummer shine with exactly equal force on each of these articles for several hours; then let Professor Wells place one hand upon the iron and one upon the flannel, and he will soon find the difference. The blister on one hand and the comparative comfort of the other will take the conceit out of his philosophy, that all the articles in a room of the same general temperature have the same degree of heat, far quicker and more radically than any arguments I can produce.

On page 216 of the work it is said: "A heated body, *cools itself*." I have frequently heard about a man lifting himself over a fence by the straps of his boots, but never regarded it as a possible feat; however, if this statement is true I shall have to reconsider the matter. If a heated body can *cool itself*, what is to hinder the successful inauguration of perpetual motion? Of course, if cold is *nothing*, a heated body must cool itself.

On page 218 we are told that "Cooking vessels are often furnished with wooden handles, which conduct the heat of the vessel too slowly to render its influx into the hand, painful, etc. Now if all the articles in the room are equally hot, or all of them in the same temperature equally hot, how does it come that the wooden handle is *less* hot than the iron handle *exactly in the same temperature*? The mere conducting qualities of the two bodies amount to nothing, if *equilibrium is already established*."

Page 246. "If water be taken into an apartment whose temperature is several degrees below freezing point, and allowed to congeal, it will render the room sensibly warmer." What! when every article in a room of the same mean temperature must possess exactly the same degree of heat or cold?

But this fact, with the others produced, furnish the most conclusive proof of my position, that the cold drives out the particles of heat from a body as it takes possession of it. And I may say there is not a solvable problem concerning heat and cold of which I have any knowledge, that this hypothesis of the two forces will not satisfactorily explain.

I might prolong this line of observation indefinitely, but the limits of articles in this magazine will not permit such a course. I have probably made my position sufficiently

clear for the reader to understand it, whether he be philosopher, sage, or common citizen. I will add a few reflections and then pass the subject over to the calm consideration of the thoughtful inquirer after truth.

That cold is one of the forces of Nature seems to me evident from a multitude of reasons, some of which I name:

It is impossible for a nonentity to do the works that it performs.

It is equally impossible for the mere non-action of heat to accomplish these stupendous achievements.

Its effects can both be *seen* and *felt*, which, I take it, is utterly impossible with any effects that nothing or simple privation can produce.

The simple absence of any force or substance, cannot produce any results which are at all comparable to the effects of cold, if, indeed such absence can produce any efficient result of any kind.

Cold, whether it be something or nothing—and it must be one or the other—is taken hold of, so to speak, and used in all the walks of life. The blacksmith fastens the tire upon wheels, cools his irons, tempers his tools, and does many things by its aid. He evidently regards it as more than nothing.

It is utilized in refrigerating apparatus of various kinds, and for a great variety of purposes. It destroys whole armies, as in the case of the First Napoleon in Russia, and congeals to death all who are exposed to its death-chilling power. Artificial cold, like artificial heat, is utilized in numberless ways; and among others to produce ice by freezing water under a tropical sky, and beneath a blazing July sun.

Without stopping to enumerate other modes of bringing this principle into use for man's comfort or profit, or to point out its tireless activity and unmeasured force,—for a volume would scarcely suffice to name them,—I remark that it has a dominion of vast, if not limitless, extent. It holds sway over a large portion of our earth; and in the regions beyond it, from the best information we can gather, it reigns over a boundless realm, the only places where it is not supreme in all the "vast fields of God," being the stars or suns and their planets, which occupy but a small portion of universal space.

Now, can it be possible that a mere negation shall have all this power, accomplish all these astounding feats, both of usefulness and destruction, and hold undisputed sway over one of the largest empires in the universe under control of any one force?

In every aspect, whether it refers to what it does, or what it is, it is impossible for me to reach any other conclusion than that cold is one of the most potential forces of Nature to be found anywhere in the universe, or at least, of which men have any knowledge, and that it is irrational to think otherwise. Eternal Wisdom, or any other kind of wisdom, could not possibly lavish such prodigal gifts upon nothing!

If I am correct in this conclusion, then our philosophy should be graduated to this great truth at once; for until it is, we shall teach error, and never reach truly just, logical and correct scientific results.

OSKALOOSA, KANSAS.

THE "CHRISTIAN QUARTERLY REVIEW."

In the October number of this ably conducted Quarterly, published at Columbia, Mo., President Clark Braden appears in a well written, but egregiously mistaken criticism of our *Problem of Human Life*. At the request of several friends, we wrote to Dr. Herndon, the Editor, asking if he desired or would permit a reply from our pen in the January number of the *Quarterly*? His answer was favorable, and the following reply has been sent and will appear in the *Quarterly* simultaneously with this issue of THE MICROCOSM. It will be seen by the closing remark in our reply that we have consented, at the request of Dr. Herndon, to contribute a regular paper for his April number upon the present exciting subject of *Substantialism*:—

WILFORD HALL'S REPLY TO CLARK BRADEN.

(From the *Christian Quarterly Review*.)

I have been no little surprised on reading the criticism of President Clark Braden of my book—the *Problem of Human Life*—as published in the October number of the *Christian Quarterly Review*. My surprise is based upon the fact that so able a writer, and one so profoundly critical, should have entirely misapprehended the teachings of a book he attempted to criticise. Had President Braden first submitted his paper to my inspection, before sending it to the *Quarterly* he would have been so completely set right that he would instantly have consigned it to the waste basket; for, with one single correction which I am about to make, not a shread of point or pith, will be found remaining of his highly syllogistical and logical production. I say "syllogistical and logical," because no fault whatever can be found with the force of his reasoning—provided only that his assumed premises were correct. But they being all wrong, and even a caricature upon my teaching, all the syllogistical reasoning in the world can never make his contribution anything more than a sorry failure.

We state in a word that the fundamental idea or proposition which runs through his entire paper like a vertebral column from its first to its twenty-first page, is the assumption that only two substances exist in the universe, namely, *matter* and *spirit*; and that God, being wholly spirit, could not have originated the material universe out of His own substance, because matter and spirit are essentially different in nature. Consequently, as matter cannot be self-existent or co-existent with God, it must have been created out of nothing. This we apprehend will be admitted even by President Braden himself to be a correct statement of the leading idea of his criticism. But lest the readers of the *Quarterly* did not examine the argument with that critical attention which it deserved to receive, we must quote a few sentences to give the true inwardness of its intent and meaning:—

"*Self* or *spirit* has not the physical properties of *matter*. *Matter* has not the rational

moral qualities of *spirit*. Does Dr. Hall admit these distinctions? If he does, he admits there are *two substances, two essences* in the universe. If he denies them, he contradicts the intuitions of our nature and must end in pantheism, and finally land in materialism. Admit, as he does, that there is such a substance as matter, and then assert that there is but one substance, and you admit that matter is that one substance. Claim that there is but one substance, and assert that spirit is that one substance, and you must deny the existence of matter, and the difference between matter and spirit," etc. "If Dr. Hall asserts the essential difference between matter and spirit, and that matter cannot have the essential qualities of spirit, rational moral qualities, and that spirit cannot have the essential properties of matter, physical properties, he places a chasm between *matter* and *spirit* that utterly forbids the idea of *matter* being made out of *spirit*," etc. "There are striking resemblances between the position of the author of the *Problem of Human Life*, and the position of the spiritualist. Both assert that there is *but one substance* in Nature. The spiritualist asserts that *matter* is that one substance. The author of the *Problem*, that *spirit* is the one substance," etc. "Dr. Hall assumes that *Spirit*, the only self-existent substance, brings matter into being by *condensing a part of his own substance*. I do not see how condensation can change the *essential nature of spirit*, how condensation can give to spirit physical properties, properties of which it was absolutely destitute," etc. "Turn it around as he will, Dr. Hall will have to concede the creation of matter out of nothing by self-existent Spirit to the orthodox," etc. (pp. 562, 563, 565, 567, 568.)

This is enough, and, as before observed, it shows the entire drift of his paper to be based upon an erroneous assumption as to what the *Problem of Human Life* teaches. With all its reiterated statements and logical inferences, the whole article can be brushed aside when we simply state, for President Braden's information, that we never taught or thought of teaching any such doctrine as he has attributed to us. We have never once intimated or even thought that matter was made out of spirit. We never thought of teaching that God took a portion of His Spirit, and condensed it into a material world. We never dreamt of teaching that there are but two substances in the universe, much less but one, and that these two substances are spirit and matter. We hold, on the contrary, and distinctly teach that there are many essentially different substances in the universe under the general classification of material and immaterial entities, and that spirit-essence belongs among the immaterial substances of Nature. How President Braden could deliberately assert, and repeat it in different forms of expression about twenty times, that we teach but one substance,—spirit,—and that matter came into existence by the condensation of spirit, is a mystery we leave the reader to solve. I regret that President Braden has not been a more attentive student of Substantialism as it has been so elaborately discussed in the pages of THE MICROCOSM during the last two years. Had he been he would have been a clever substantialist by this time, and would

not have been betrayed into so gross a misapprehension of our views. Let us try to enlighten him a little.

Take the substantial force of *gravity* which I hold to be a real entitative substance, as much so as is the granite rock which it causes to fall toward the earth's centre. But it is immaterial substance. Will President Braden say that this substance which we call gravity is spirit? Certainly not. Will he say it is matter? Not at all. He says vaguely that it is a force of Nature as are also *magnetism, electricity, heat*, animal and vegetable *life*, etc. That is true of course. They are forces of Nature, but they are substantial entities, nevertheless, as we have shown repeatedly in both the "*Problem*" and *MICROCOSM*, and which President Braden would not deny. Now, animal and vegetable life or vitality is not spirit in any sense, though it is substance. Neither is it matter. Then what is it? Plainly it is an immaterial substantial entity which, as we teach in the *Problem of Human Life*, came originally from the great fountain of life which constitutes a portion of the exterior essence of God's nature and being. President Braden's fundamental error is, in assuming that God is *allspirit*, the very thing he should have attempted to prove, instead of taking for granted that this false assumption represented correctly my views. I never taught or thought of teaching such a thing. I hold that God, as a personality, has a body as well as a spirit. Because God is declared to be a *Spirit*, it no more follows that He is all Spirit than His being declared to be love, proves Him to be all love; or than His being declared to be a consuming fire, proves Him to be all fire or vengeance. I never supposed it necessary in philosophically denying that God created matter out of nothing, as I did in the "*Problem*," to assume that He must have condensed a material world out of a small portion of His spirit-essence. Were God originally constituted of spirit only, then President Braden's inferences would have been logical and his numerous questions pertinent. Why did he not quote some sentences from my book showing that I held the views he attributed to me, namely, that God's personality was spirit only, and as a consequence that no other substance in Nature goes to make up any part of His omnipresent being. He evidently had the book before him in writing his criticism, or at least ought to have had, yet it is a most singular fact that in the whole twenty-one pages not a single sentence does the critic quote to show our position or views to have the slightest resemblance to his representations of them. He merely goes on to reiterate in numerous interrogatory and other forms of expression, that we teach the absurd and unnecessary doctrine that God condensed a small fraction of His Spirit-essence into matter! It is the first unfavorable review of that length of my book or of any other book prominently before the public that I have ever read, in which not one sentence of the author's language is quoted to give the readers the benefit of his views in his own words.

Now we had intended to write no more on this subject of "creation out of nothing," as we intimated in a recent number of *THE MICROCOSM*. We had come to the conclusion that the discussion was, to say the least, less profit-

able than more practical matters in science, philosophy, and religion; and as there was no possible hope of a finite mind ever grasping or comprehending the *modus operandi* of God's infinite methods of creating the universe, we had concluded quietly to subside upon that vexed question and let the matter drop. President Braden's singular and I may add unfortunate review, however, has forced me into this explanation. And to make myself fully understood, I put the question: Is it not reasonable to suppose that God, as a *personal* Creator, possessed from eternity not only an omnipresent spirit or intellectual power that grasped infinity, extending through all time and space, but that He also possessed a body equally omnipresent constituted of the eternal but immaterial elements and forces of Nature, and that these forces and elements were the original things that do not appear out of which He made the "things that are seen"? It heightens my conception of the grandeur and dignity of God as an infinite Creator to suppose that before matter existed He embraced within His own personality and essence the substantial "things" out of which material worlds were to be made as well as the infinite wisdom and power that enabled Him to make them. Such a view leaves the eternal I AM without a competitor. To assume as President Braden does that God was Spirit only, and that He could not have embraced within His omnipresent being other substances, is a narrow conception, which in my judgment limits the Almighty vastly more than to deny His ability to create *something* out of *nothing*, which in itself is opposed to all reason.

How natural and rational then to suppose that God took of the substantial but immaterial elements and forces which then constituted His exterior being, and condensed or otherwise changed enough of them to form the material objects we now observe! The very fact that every atom of ponderable matter continually emits rays of unseen gravital substance, makes it highly probable, to say the least, that the material atom itself is but condensed gravity held together by condensed electricity as its cement. Of course President Braden would say in reply to this, if gravity could by infinite power be condensed into solid matter, its "essential nature," as he so frequently expresses it, would not be changed by such condensation, and hence gravity must have been material substance, in fine attenuation, before such condensing process took place, and consequently God must have been partly material, and hence matter, as a part of God, was eternal, and hence "pantheism," etc., etc. But who told President Braden that an infinite God could not change the "essential nature" of an immaterial substance, like gravity or electricity, by the infinite process of condensing it into a solid? It is surprising to read the President's reiterated assertion, that it would be impossible, even for infinite power, to change the "essential nature" of spirit, and thus condense it into matter, after avowing his belief that *matter* was created out of *nothing*. He maintains that the thing condensed necessarily must retain its former essential qualities and properties, and that it must have the same "essential nature" afterward as before. Then, if the

logic is good, it follows that the "essential nature" of "nothing" would remain the same after it was condensed or otherwise converted into matter! Hence President Braden must believe that *matter* is still absolutely *nothing* in essence and *vice versa*; that is, *nothing*, out of which matter was made, must have had a *material* nature from all eternity, and consequently matter is co-existent with God! Surely, if God made solid matter out of *nothing*, He had something very much rarer and less substantial to work on than *gravity* or electricity, and must have changed the "essential nature" of such manufacturing material, one would think, before it could have become solid matter. If it was not by condensation that God made solid matter out of *nothing*, but by some synthetic process known only to the infinite mind, then we have only to suppose that He applied the same synthetic principle to *gravity*, (a real immaterial *substance*) which He did to *nothing*, and we at once avoid by such reasonable supposition the eternity of matter, the bugbear of "pantheism," and the unthinkable idea of the creation of matter out of nothing. Plainly, President Braden ought to be able to see that unless "*nothing*" had undergone an "essential" change in its nature, it could hardly have become solid matter to any alarming extent! And if God was able, as our critic avers, to make the material universe out of immaterial and even insubstantial *nothing*, it is he who limits the Almighty by claiming that He could not have changed the "essential nature" of immaterial though real substantial *gravity* to the same degree by the infinite act of condensing it. Humanly speaking it would seem to be a much easier task to create matter out of an immaterial *something* (*gravity*) than out of an immaterial and unthinkable *nothing*, even if the Creator had to change the "essential nature" of the *something* He employed in doing it. In choosing between two great mental difficulties, it seems to us only the part of wisdom always to choose the lesser.

In the light, therefore, of this unquestioned principle of logic, why could not the Creator, in the exercise of His infinite power, have condensed pure spirit, had it been the only substance in the universe, into a material world by so changing its "essential nature" as to take out of it all of its moral and intellectual qualities substituting physical properties in their stead? Surely, as before urged, an unlimited power that could create any known substance out of *nothing* ought to be able to change one substance into another, even if the "essential nature" of the two substances differed. President Braden, with all his orthodoxy on this question of "creation out of nothing," is the one justly chargeable with limiting the Almighty. In fact, he not only limits the Creator, but he has reasoned himself into an inextricable difficulty in so doing; for such a change of the "essential nature" of spirit—a real substance—as to convert it into matter, is vastly less difficult to conceive, than to have so changed the "essential nature" of *nothing* as to convert it into *something*! In all candor we ask if it is fair to charge us with teaching an unreasonable or absurd doctrine (which we never taught), namely, the condensation of spirit into matter, while he himself teaches the

infinitely more unthinkable notion of making matter out of nothing at all? Yes, according to President Braden, it was easy for infinite power to use pure *nothingness* out of which to make solid rock; but it was impossible for Him to change one real substance into another, just because the two substances happened to differ in their "essential nature!"

Fortunately, there was little necessity for the condensation of *spirit* into *matter*, and vastly less for employing *nothing* as a manufacturing material—since according to the principles of Substantialism, *gravity*, electricity, heat, light, magnetism, vitality, etc., as the clothing or exterior nature of Deity, were all real substances, and though they were neither *spirit* nor *matter*, they were, nevertheless—to express the law in a word—*so related to both matter and spirit in their essential nature, as to be used by the one out of which to make the other*. Is not this plain common sense.

Finally, President Braden asks me, in one of his fifty or more interrogatories, "Why do you so dogmatically assert that omnipotence cannot create matter out of nothing?" We answer President Braden by asking him a similar question: Why do you so "dogmatically" assert that an omnipotent God cannot change the essential nature even of spirit if necessary, and thus condense a fraction of it into a world without interfering with or diminishing His own personality? And why cannot so able a scholar, and versatile a critic see that the changing of any one real substance into another, even if one is essentially different in nature from the other, is vastly more thinkable and rational than the making of any real substance out of nothing? We could thus bombard our critic with a hundred questions similar to his own, going to show that he has constantly limited the Almighty by speaking of the "essential nature" of a given substance as a barrier against infinite power changing it into something else. A critic who can deliberately accuse an author of "dogmatically" limiting the Deity by not admitting the possible creation of something out of nothing, should be the last man to call in question our view, that "of Him are all things" and that "the things that are seen were not made of things that do appear," but were made out of the invisible things of God, incorporeal things, real immaterial substances,—the eternally existing elements and forces of the universe which constituted the body and clothing, so to speak, of the infinite Spirit of Jehovah. We hold this view because it has the true ring of common sense, and is every way reasonable, scientific and philosophical; and we cannot but believe that the time is not far distant when it will be the prevailing view among Christians as vastly preferable to the old dogma of the creation of matter out of nothing. It permits an intelligent and rational faith in God's personality and attributes instead of a totally blind surrender to impossible suppositions. Still, if any one finds it more consonant with his conceptions of the character and attributes of the Deity to accept the old view, we surely have no quarrel with him on the subject, and he ought not to quarrel with us. Let us wait for the light of the perfect day to dawn, when we shall see eye to eye, and know even as we are known.

Having thus finished our answer to President Braden's criticisms, and in as amiable a manner as possible, involved him inextricably in the meshes of the net he was trying to wind about us, we propose now to let the readers of the *Quarterly* see what we understand to be a fair, logical and philosophical criticism of our position on this subject as urged in the *Problem of Human Life*. It is from the pen of no less a scholar and logician than Elder Thomas Munnell, A. M., one of the ablest thinkers and writers of the century on such abstruse religious-philosophical subjects. We make the following extracts from a paper he communicated to THE MICROCOSM, and which appeared in the first volume at page sixty-five. It reads almost as if it had been written in reply to President Braden's criticisms. Speaking of our views, he says:—

"He maintains that as all things are 'of God,' 'Of whom are all things,' so all the elements of matter are but condensations of His 'exterior nature,' and not a product from nothing; that 'physical organisms were condensed and framed out of that portion of God's omnipresent substance suited to such material existences; their vital parts out of a higher, finer grade of God's substantial nature; while the mental faculties and spirit were but drops out of the higher qualities of God's substantial intelligence and spiritual essence.'

"Admitting that the mental faculties and spirit were 'drops out of God's spiritual essence,' and not 'attenuations' of the finer elements of matter, it still leaves the doctrine that electricity, magnetism, animal life, and all physical organisms are in the nature of 'attenuations' of the grosser forms of matter; or, which is the same thing, that these organisms are but condensations of higher elements from God's own exterior being. Now, is the idea that 'an immaterial substance can be transformed into a material body' unscientific and irrational? If immaterial substances can not be 'condensed' into the material, it is equally true that the material can not be 'attenuated' into the immaterial; and hence it has been objected with some force that attenuation of matter does not destroy the properties of matter; that if matter be ponderable, tangible, corruptible and divisible, no degree of attenuation or condensation would, in such particulars, change its nature. But as true scientific ideas are often embarrassed by the imperfections of human language, I suggest that instead of the words 'condensation' and 'attenuation,' we use the words *synthesis* and *analysis*, and see if the above objection will have the same force.

"While it is true that attenuated matter may still possess some, at least, of the same properties it had before, is it true that matter *analyzed* possesses the same properties? The air is attenuated as we ascend from the surface of the earth, and is homogeneous at all altitudes; but if we analyze it, are its elements homogeneous with the air? Do the oxygen and the nitrogen of the air, when set free, possess the qualities of the air when undecomposed? If attenuation is always responsible for homogeneity of substance, is analysis responsible for it also? Analyze water, and are its oxygen and hydrogen of the same nature as water, or but attenuated water? Are they alike visible or ponderable, or do they taste like water? Or take light—white light—and decompose it, and why does no one of the seven colors in the least degree resemble the original white? Here, again, analysis is not responsible for homogeneity, of which chemistry will give us ten thousand proofs. Is not

all material nature composite? and may not every substance be analyzed, no matter how gross, into higher and finer grades of matter?

"Then as to *synthesis*, the process is simply reversed, and the evidence is the same. How it is that oxygen and hydrogen so shake hands, fill each other's interstices, and marry up each other's little infinitesimals, as to produce a *tertium quid* in the shape of water, so different from both, is a secret that lies deep in the unraveled arcana of God. But the great truth taught by this *synthesis* is the same as that taught by analysis—that it also is not responsible for homogeneity. The same is true when you throw oxygen and nitrogen back into air, and the seven colors into white light, namely, no homogeneity.

"The above facts, running both up and down the scale, clearly show that *analysis* results in higher grades of matter, and that the elements of the coarser forms are of finer quality than the forms they compose. How this can be, may be a mystery that will forever outfathom all our measuring-lines; and yet, the fact itself is indisputable. As in the case of water analysis into oxygen and hydrogen, if we had some powerful laboratory process by which we could analyze oxygen, analogy would evidently say that its elements, should it be found a composite substance, would prove to be of still higher grade, and equal, possibly, to electricity. Nor is it inconceivable that a still further analysis would discover elements equal to vital energy; and so on, till in thought we reach the hypothetical "exterior nature of God," from which elements may have been synthesized first into the finer, and then into the grosser elements of all the "physical organism" in the universe, as well as all material existences. This view of the case certainly shows that the hypothesis that God "evolved all things from Himself is not "unscientific," for it is only following out certain well-known scientific facts to their analogous ultimate, besides harmonizing with the Scripture, 'For of Him and through Him and [back] to Him are all things.'

"But is it probable that God has any such "exterior" nature as the hypothesis demands? Here the gates stand ajar but little; and yet we have a right to whatever hint may be found either in Nature or the Bible. And first we see in ourselves, made in the image of God (perhaps on the general plan of God's own organization), the "inner and the outer man"; and in the next world "we" are to have heavenly "tabernacles," and these "vile bodies" to be transformed like "Christ our glorious body," and He is the "express image" of God;—from all of which it is rather probable that God is possessed of an "exterior nature"; and if so, the supposition that He synthesized the universe out of said nature is not absurd, nor as unscientific as that He made all things, material and immaterial, out of absolute nothingness.

"Nor is there any more danger of His wasting away His exterior nature by thus educating all material things, than there is of His wasting His spiritual-essence by becoming the "Father of all spirits" in all worlds. He that makes millions of suns to burn, for decillions of centuries for aught we know, with undiminished heat and splendor, without the least evidence to us of a supply of fuel for their wastes, is not likely to be embarrassed by the slight expenditure in creating all "things present and things to come" in any manner He may see proper. The fact that "the things which are seen were not made of things that do appear" (Heb. xi :3) shows that all gross visible substances were composed or synthesized out of higher, invisible elements which were all *substantive*, but in their

highest and last analysis not necessarily *material*. And if gross matter loses one property after another by successive analyses, why might not the last analysis drop the last property of material substance, and reach the frontiers of "the exterior nature of God" required by the hypothesis before us, as assumed in "*The Problem of Human Life?*"

We commend to every reader carefully to study Elder Munnell's criticism in contrast with those of President Braden. We close by adding that, by special request of Dr. Herndon, we have agreed to furnish a regular paper for the *Christian Quarterly Review* for April next on the new philosophy of *Substantialism*.

THE LIMITS OF DEVELOPMENT.—A PLEA FOR THEISTIC EVOLUTION.

BY PROF. A. C. FERRIN, A. B.

The time has come when the theory of Evolution cannot be dodged or put aside with derision. Darwin can no longer be laughed at or condemned with impunity. Every thoughtful man is forced to consider the question thoroughly and fairly. It faces not only the scientific man but the Christian man, the man who has his faith firmly grounded in the Bible. How can the theory of Evolution and the Scriptural account of the origin of things be made to harmonize? This is to be the great question of the future. It is already the question that most frequently meets every intelligent Christian man, and he is satisfied only by some reasonable reconciliation of the two seemingly conflicting modes of creation. It is true that any such settlement of the question can only be theoretical. So Evolution is a theory, and the Bible account of the creation is so metaphorical as to make it theoretical; but all human knowledge cannot be practical. The mind does not demand it; but from its very nature, a spiritual substance transcends the sphere of practical knowledge, and seeks in the theoretical a fuller expression of its legitimate aspirations. Want of practical proof does not destroy the validity of knowledge, if it satisfies the cravings of the soul and the convictions of conscience and reason.

It is perfectly legitimate for us to settle the question by resting on some reconciling theory, if we can establish our position by sound logical argument. The fact that we are resting on a mere theory does not render our position untenable or unsatisfactory.

Man is as fully justified in seeking a knowledge of his creation, as of his future destiny; but to be consistent, to get at the whole truth, we must look to both Nature and Revelation, the two great sources of truth, for this knowledge. Though both are filled with mysteries to the finite mind, possessing the same author, they must be conformable to each other; and the man who confines his studies to the one, exclusive of the other, cannot attain that knowledge which, in its extent and grandeur, the Creator has made it possible for him to attain.

The traditional interpretation of the Scriptures a half-century ago revealed only the theory of "immediate Creation." The opinion of Nature had not been sought till England's great naturalist gathered from her pages another answer to the great question. Charles

Darwin has been in natural science what Kant was in mental science. He destroyed dogmatism by introducing a critical study of Nature; but by confining himself too strictly to physical phenomena, and by confounding the physical with the spiritual, he ran into agnosticism. Evolution, had it not been extended to Darwinism, would to-day have found few opponents. We must draw the line sharply between Evolution and Darwinism. They cannot be treated as one and the same, for they have a difference as marked as those of the physical and the mental world, of matter and spirit.

In studying the plant and animal life of the earth, both extinct and extant, it is easy, indeed almost impossible *not* to find Evolution stamped upon every age from the lowest Paleozoic to the present. The theory is not only plausible and reasonable, but it is imperative. But when *man* is reached, when the theory endeavors to embrace him, soul and body, man stops. There is something in him that tells him the theory has gone too far. He may go on; but if he does, he goes on in contradiction to his very nature.

It is not a repulsion at the theory that he is *physically* a descendant of the ape, that stops him? No; it is an instinctive protest against the idea that that which makes him a man, a rational and moral being, is evolved from brute nature, from which he is separated as far as mortal is from immortal, as time from eternity. The material and spiritual may be consistent, harmonious in their actions, but they cannot be the same essence. There is no similarity between them; the former may be the organs through which the latter manifests itself, but it cannot be its originator.

At the edge of this chasm which exists in Darwin's theory, every man stops,—even the great naturalist himself was compelled to pause; but he ascribed the chasm to a missing-link, and as he could not find the link to bridge it with, he jumped over and went on. Darwin's missing-link has never been found. It may be found; but whether it is or not, whatever its shape or characteristics, it either will or will not have a soul, and the chasm still remains. It may complete the chain of physical evolution, but it cannot form a bridge between the physical and spiritual. Darwin failed in mistaking incongruity between the spiritual and material for unconnectedness in the material.

But let us now step over to the other side of the chasm; here we find the same law of Evolution as evident in man as it was before in animal, but it is now two-fold in its application, manifest in spirit as well as in matter; the two advancing under the same law, in the same direction, connected but distinct—the latter a continuation of what was on the other side the former starting on this side. Evolution in succession. Evolution subsequent to immediate creation. Why not? Evolution cannot be put aside; it has left its footprints too plainly stamped on the pages of Nature. Neither can we conceive the spiritual as evolved from the material; and if man be evolved from animal, either man is a brute, has nothing spiritual and immortal, no soul, or else animals must share with man the blessings or sorrows of eternity. But there is something in man that tells him he has a soul; and it is the well-nigh universal

judgment of mankind that the body of the brute, though animate is not ensouled. Man's body dies the death of the brute, his soul lives the life of its Creator. May not the one be a creature by evolution? Must not the other be an immediate creation?

Look back to the geological history of the earth. We find adaptation to be the principle that controls the possibilities of all life. At one time the sea possesses the highest forms of animal life. Later on, the land. Now delicacy of structure, now strength rules. As the earth in its development became more complete and suitable for the abode of man, so animal structure became more complicated and more wonderful, till at last in its delicacy and gracefulness, in its capability of action and perfection of the higher organs, it became a fit abode for that which distinguishes man from brute, a suitable organ through which the soul might manifest itself. We can't conceive of the Creator as consigning that which He created in His own image, to a body that could not perform the functions laid upon it. It was not till animal nature could stand erect, that it was fit to carry a soul. It was not till then that God breathed into the material body the living soul; not till the law of evolution had thus far developed material substance, that the Creator imparted to it that which is a part of His own essence.

From Nature turn to Revelation. Was not man created last? Last, because only then was the earth ready to receive him. According to the Scriptures creation proceeded from the low to the higher, from the inanimate to the animate, from the material to the spiritual. There was a development, an evolution; but this development, this evolution stopped when man was reached, when, to the material, the spiritual was to be given. God said, "*let the earth bring forth grass;*" "*let the waters bring forth the moving creatures;*" and "*let the earth bring forth the living creature after his kind;*" "*but let us make man in our image;*" and "*He breathed into his nostrils the breath of life; and man became a living soul.*" The spiritual was imparted to the material, not evolved from it.

Thus, in the ultimate development of a natural law, the immediate gift of the Creator found its dwelling. In its union with the body the soul, as it expands, as its powers are unfolded, finds its power of expression. Death alone severs them; and the body losing its identity, goes back to the dust that evolved it; and the soul, preserving its identity, to the God who gave it; the one to await the mysterious and supernatural revelations of the resurrection, the other to realize the untold possibilities of eternity.

ESSEX, VT.

THE MODERN THEORY OF FORCE—NO. III.

BY REV. JOS. S. VAN DYKE, A. M.

Force is indestructible. The cause is always equal to the effect. In a connected series of causes and effects, no term and no part of any term can become equal to zero. If a cause *a* produces an effect *b* equal to itself, and *b* produces an effect *c* equal to itself, and *c* produces

an effect *d* equal to itself, and so on in regular succession to *z*; then $z=a$; *a* still lives in *z*. It has not been annihilated. If the series was infinite, the last factor would be the exact equivalent of the first. If *a* produces two effects, *b* and *c*, equal to itself; and *b* and *c* each produce two effects, *d* and *e*, *f* and *g*, the two former unitedly equal to *b*, and the two latter unitedly equal to *c*; and if *d e f* and *g* each produce two effects, *h* and *i*, *j* and *k*, *l* and *m*, *n* and *o*, there being in each twofold effect the exact equivalent of its cause; then *h, i, j, k, l, m, n* and *o*, however they may differ among themselves, are together equal to *a*. No force has been annihilated.

Having thus explained what is meant by the indestructibility of force, I need not pause to present proof. It is a doctrine which has been clamorously dinned into our ears for twenty years, and is now accepted by the entire scientific world.

Now our argument. If the physical forces are indestructible, and as already affirmed are immaterial; then, evidently there is no antecedent improbability in the doctrine of the soul's immortality, but a powerful argument from analogy in its favor. If physical force is imperishable, is it not illogical to assert, without the shadow of proof, that the soul, a spiritual force, perishes with the body? If other forces are indestructible, why not this? Is the disintegration of the crystal the destruction of the force that held its molecules together? No. Is the decay of the plant the annihilation of the forces which concurred in its upbuilding? No. Is the dissolution of the body an eternal end of the forces which aided in its construction? No. Then why conclude that death ends conscious existence? The physical forces that leave the crystal, that leave the plant, that leave the body, are still unchanged in their nature. They exist under new forms. Analogy asserts, then conscious existence remains unchanged in its nature. It does not perish, for force is indestructible. It does not become unconscious, being absorbed into the infinite ocean of spiritual being; for forces remain substantially unchanged in their nature, merely assuming new forms. But a loss on the part of man of the sense of personal identity, would be a radical change in the very nature of that force which we denominate soul. Analogy warrants us in asserting,—the conscious soul may exist under new conditions, may assume new modes of manifesting its activity—annihilated it can not be.

If, with the view of blunting the edge of this argument, any materialist is disposed to say: It has not been proved, nor can it be proved, that any physical force either exists, or can exist, dissevered from matter, we answer: It has not been proved, nor can it be proved, that the soul at the death of the body may not construct for itself an invisible substantial body. If it constructed for itself a terrestrial body, may it not also construct for itself a celestial body? This, at least, is true; the purely gratuitous assumption that the soul, when dissevered from its material tabernacle, is in a disembodied state and therefore perishes, has no cogency whatsoever against the arguments for its continued existence. The utterly unsupported assumptions, that the soul is bodyless when it parts

from its clay dwelling, and that spirit can not exist apart from matter, have no weight against the reasoning from analogy that spiritual force is indestructible. Christians have a right to speculate as well as materialists. If we conjecture that the soul, when it parts from the visible body, takes upon itself an invisible body, which may have been its enswathement in the tangible casket; or if we conjecture that spirit may exist without a material accompaniment, have our conjectures less cogency than those of our opponents? Nay; they have more. The former conjecture may be supported by reasoning. It may be the doctrine which Paul means to teach in 1 Cor. xv: 36-54. Nor is the second conjecture irrational and inconceivable; for if forces are spiritual in their origin and immaterial in their nature, there is no apparent contradiction in assuming that spiritual forces—souls—may exist independent of matter.

(To be continued.)

THE THINGS UNKNOWN.

BY PROF. JACOB CHAPMAN, A. M.

When an intelligent man carefully looks upon the wide field of knowledge around him, he will be surprised to learn how many things he does *not know*.

It is hard for us to learn our own ignorance; and still harder to confess it, publicly. Every inquisitive mind is forever grasping after new acquisitions in knowledge; and yet how often do we come back from the chase without bringing much addition to our treasures.

So I have come to think more highly of the man who, instead of attempting to cover his ignorance with a cloud of unmeaning words, honestly and openly says, "I do not know." This is what some of the ablest scientists have said, occasionally; but a great crowd of their followers and admirers, indignantly *reject* these expressions of their masters. Among the things which finite mortals cannot fully comprehend, are the Eternity of God, His omnipresence and Omniscience, and the manner in which He made man a free moral agent. The existence of evil is closely connected with the origin of free agency; for no man can make a choice between *good* and *evil*, if there was no possibility of any evil. When we undertake to bring down these great mysterious subjects to the comprehension of finite mortals, we are very apt to "darken counsel by words without knowledge."

If we endeavor to paint the character of the Deity so as to suit the infidels of every class, we shall never succeed in accomplishing our end. If they do not like the God of the Bible, let them find a better one, if possible, and worship Him in a purer way; and then show us the results of their doctrines, in the conversion of sinners, and in the improvement of saints.

Men will often pervert the Scriptures and deny the truths which they teach; but it is a more pitiable sight when they pervert the truths of science, and deny the conclusions of reason, and expect us to follow them into the untrodden paths of uncultivated imagination, where fanciful dreams take the place of old established truths.

They should remember that an argument

which proves too much, cannot be reliable, nor prove satisfactorily anything but its own worthlessness.

To undertake to prove the *goodness* of God by denying His *wisdom*, affords a case in point.

We are told that God would never create men to be forever unhappy. But we are not told *how long* He may permit them to be so unhappy, as many of them are at present. Some say they will be happy as soon as they die, but they do not prove it.

Others kindly come in to defend the moral character of God, in the permission of sin and suffering. We would like to have the Lord appear well in the eyes of all men. So these philosophers apologize for the doings of the Eternal God somewhat in this fashion: "The good, dear Lord, *means* well; but He cannot *foresee* the results of His work. Other unknown agents resist His will and defeat His purposes." If this were *true*, the Creator would seem to stand in more need of our pity than of our reverence and fear. If the Holy One who sits on the Throne of the Universe must wait till His creatures act, must come down and sit at the feet of sinful men in order to learn how vile they may become, it will be hard for most men to honor and to obey Him. This theory lies at the foundation of the Polytheism which prevails among many heathen people who believe that the evil in the world is the work of a *bad god* whom the *good God* cannot control. The good spirit will not injure them, but they fear the bad spirit; and offer sacrifices to propitiate his favor. It is hard to believe that the giver of all wisdom and knowledge is ignorant of what any man may do on the morrow; and that the Almighty will ever be defeated by any of His finite creatures. I would not like to sit in judgment upon the Maker of heaven and earth, the Father of spirits, and charge Him with ignorance or injustice because He has admitted sin and suffering into this world. If you ask me why God has permitted sin, I say "He has never told me; and I do not know." The difference between the finite man and the infinite Creator is so great that when we attempt to compare Him with ourselves, we are apt to reach erroneous conclusions.

But some things are plain. I am not the sport of blind chance, but a free moral agent, accountable to Him who placed me here; and I can see no reason to doubt that He who placed me here knew, from the beginning, how I would employ the powers He has given me.

I read in the Scriptures many predictions of events which depended upon the actions of free agents which must have been foreseen to be certain. I cannot see how the certainty of any choice by man can impair the freedom of that choice, for all the freedom of choice comes from the ruler of all.

Do we not admit that every act or event must have an efficient cause? Is not this law of cause and effect as necessary in spiritual as in material things? No man ever makes any *choice* without some cause for making it, rather than making the contrary choice. To say that men are compelled to choose without any *reason*, teaches a *fatalism* which is subversive of all true *freedom* of thoughts. Does not God see as clearly as we do the reasons which in-

fluence every choice we make? The fact that we are affected by the power of different *motives*, does not interfere with our *freedom of choice*, but only leads us to exercise the power of choice.

Do you say you cannot *believe* in the goodness of God because you cannot see all the reasons for what He does? You might as well deny His Eternity, because you cannot comprehend it, and deny the infinite in Mathematics and in Philosophy.

Will you deny the existence of light and heat and sound and electricity because you cannot understand the *nature* and *essence* of these substances? There are many substances of which we know very little, though we may be very familiar with the effects which they produce. True wisdom will teach us to be humble, cautious students of Nature and of Philosophy, and will prevent us from being puffed up with conceit, so as to believe we know all about a thing, from having seen what it is known to do.

EXETER, N. H.

THE EARTH'S ANNULAR SYSTEM.

THE GLACIAL EPOCHS.

BY PROF. I. N. VAIL.

As announced in my first paper, the Earth's Annular System is the only adequate source of these snow-falls, that have many times suddenly changed the climate of the whole earth. The outer rings of Saturn, originally aqueous vapor, driven from his heated mass, are to-day *frozen vapors*, since it can be readily demonstrated that they can be neither liquid nor solid. This latter conclusion, I believe, is generally conceded by all eminent scientists. Then, as no other visible matter, rising from Saturn's heated mass, could become located as his rings now are, we must conclude that they were aqueous vapors, now frozen particles. Again the chances are only one in many millions, that a ring of any kind of matter, could locate itself around Saturn, unless that matter came from the body of the planet itself; and if solid or meteoric matter was at any time located there, it cannot now be so located, since aqueous matter would be the last to fall back upon the planet; all matter in annular formation arranging itself about the planet, at a distance from it, according with its specific gravity—the heaviest nearest the central body, must fall first. So that we are forced by the necessities of *known law* to admit that these last remaining material rings of Saturn, were aqueous vapors; and being farthest removed from planetary heat, into the cold of interplanetary space, must be frozen vapors now. But an objector may ask, why assume that such appendages must fall. I answer that it is *incorruptible law*. It results from the constant brake that a moon, or attending *exterior* body puts upon all *interior* revolving bodies; just as our moon to-day puts a brake on the revolving earth, by dragging the tidal-wave westward, until incalculable tons of momentum resists the earth's radial motion eastward. It requires, then no extraordinary powers of analysis to see that Saturn's visible rings are at least largely composed of frozen vapors. Now what would be the inevitable result when that cold mass is

broken from its moorings and precipitated upon the face of the planet? If such a mass should fall on our planet it would *fill the world with snows* and involve it in universal death, just as such snow-falls have apparently done again and again.

Now let us examine this. When the waters now on the earth was in a vaporous condition, they arose, and were whirled into revolution by the revolving earth, and were carried in that direction toward which the operating forces would drive them. But the direction of the centrifugal force of the revolving mass, super-added to the repelling force of heat, was toward the *equator*. Then the vapors, of necessity, accumulated in that region. *Let every man see that my deductions are legal!* Now if the earth rotated very rapidly, the vapors must have been flung far above the limits of the present atmosphere. Granting the distance to have been 100,000 miles, the circumference of the rim of vapor moved 25,000 miles at least per hour. Now this boundary, if I may be allowed the expression, condensed first, because farthest removed from the earth's heat. Thus condensing and segregating upon itself, and still revolving 25,000 miles per hour, it could not fall upon the inner portion, which, say revolved 20,000 miles per hour, and which inner portion also condensed and *occupied less space than before*. It can be readily seen how if two bodies, whether solid liquid or gaseous, were revolving—one 25,000 miles and the other 20,000 miles per hour—that the former would leave the orbit of the latter, and rise as it were above it. In other words, the inevitable tendency of the revolving mass would be to divide into rings as condensation proceeded. These rings would be concentric like the rings of Saturn, and revolve about the earth. Again it will readily be admitted that all matter that did not thus form must have fallen directly to the earth, upon the decline of heat. Thus leaving the rings far above the atmosphere, to be brought down in order—the *innermost ring first*. But as in annular formation the vapor arose into the equatorial regions, so in their declension their tendency would be to return and fall first at the poles. Let us see how this must be the case. Let us imagine all the primeval vapors located nearest the earth, and necessarily charged and impregnated with mineral and metallic salts, to have fallen; thus forming the "*waters under the firmament*" or atmosphere, leaving the annular system to follow in the fullness of time. (The atmosphere clear, and the sun, moon, and stars shining as is represented in Gen. i: 14.) But the moon, as with a mighty lever, checks its motion; and as a direct result it sinks toward the earth with a step as steady as time, and as sure as death.

In course of time the innermost section of the system has descended so far as to touch the outskirts of the atmosphere, and, however attenuated this may be, it at once *checks its downward motion in front*, while it continues to push onward and downward from behind. This check put upon its downward course must cause it to spread out in the *form of a belt*. This, as any one can see, must be the case; and as the rotary atmosphere must also resist its fall, it will sink away toward that part of the atmosphere where the centrifugal force of the same

is least. But the centrifugal force of the atmosphere is zero at the poles; *then the descending vapors must tend thither*. If the air were filled with such vapors to-day, they would sink *lowest*, and *fall first*, and in *greater* quantities in the polar regions, and *fall there as snow*.

Hence the tendency of a ring of vapors, frozen or otherwise, would be to spread from the equatorial to the polar regions—thus over-canopying the entire earth; while in the age just previous, the sun, moon, and stars might have been seen.

Now, so far as our knowledge of such changes extends, we may say with entire confidence that their transpiration must have extended over vast areas of time, and yet they may be measured by centuries instead of milleniums. Instead of a slow change in orbital eccentricity, requiring in some cases half a million of years to cause refrigeration, here is a change sudden and abrupt. A single year of snow-falls from the tellurio-cosmic source might be able to transform a blooming world into a universal scene of desolation, to change a climate from that of perpetual summer to that of polar rigor. But the length of time between a descent of a ring into the atmosphere until the atmosphere was cleared of these vapors, must have been great. This is philosophically shown in the length of time the last downfall consumed, from the time the last remnant of the Annular system came down upon the atmosphere and spreading toward the poles, over-canopied the earth with a great *green-house roof*, till the last deluge the earth can ever experience from such a source, involved the world in a wide sweeping death.

I have said that a declension of upper vapors requires a *downfall* in polar latitudes, *before* a rain fall in medial latitudes. Now let us see how this accords with that remarkable book, Genesis. Nothing is more graphically sketched in those pages than the *change of climate* that compelled man, who had previously lived in perpetual summer, to eat by the sweat of his face. The earth was *cursed*, and yet it is absolutely certain that the only change that could occur was a *climatical* one. The earth had yielded spontaneously her strength, but it could do so no more. The world was warm when man dwelt naked in Eden, but it was *colder when men were clothed in the skins of animals!* Place these facts together, and tell me who will, that they do not emphatically affirm a change of climate. But such a change could not have occurred but by an increase of cold, and an increase of cold necessitates an increase of snows—the only thing that could make a cold climate in a warm world. From the time of this climatal change till the final catastrophe more than a thousand years intervened. If it had to be reckoned by the geological standard, it would be about 750,000 years.

Now, with these ideas in view, let us look a little back in the past. We have seen how the last fall of vapors into the atmosphere produced a green-house world, and as we look into the green-house of the Tertiary age, we see the results of the same grand cause. Though perhaps not so warm as in Post-glacial times, when the world was more replete with the giant-tribe of mammals, yet the life of that period was

one of advanced character; and both the vegetable and animal kingdom affirms a warm climate, even under the polar circles. Many of the animals were of immense size, but they appeared to be a mixture of races, and we can scarcely compare them in dimension with existing species. Yet we well know that many of them were the "giants of those days," *just as in its Adamite age, and under the same conditions*. We know that their environment necessitated their form and character. If they were comparatively large and bulky, the atmosphere possessed more buoyant force. So that our first peep into the Tertiary age leads us to infer that a ring of vapor had descended into the atmosphere. The warm climate affirms this state, and the size of the animals supports the claim. The heavier the atmosphere the more bulky and huge the animals adapted thereto. But if such a canopy of vapors existed in the Tertiary atmosphere, they were on their way to the earth and must have fallen and closed the age by snow and water.

Now, what is the closing record of that age? *Brought to a sudden and violent termination*, the great hordes of Tertiary animals were swept from the earth as by a stroke. Their abundant remains are found in the unnumbered charnel-houses of the world.

Snows descended in such measureless quantities that a great part of the world was covered thousands of feet deep. From these, glaciers formed in almost every land. A mighty casement of ice covered British America, and a great part of the Mississippi Valley. It towered over the New England mountains, swept over Europe and Northern Asia. Nay there is scarcely a land, or a valley on the face of the earth that does not bear evidence of this prodigious fall of snow. Thus the destruction of the great *green-house* of the Tertiary age had a competent cause, for the universal glaciers were a measure of its extent.

But the most conclusive picture may be seen in the remnants of the glaciers of this age of ice. It is within the arctic circle that the most irrefragable evidence of a sudden revulsion is seen. There the animals involved in the great destruction, have remained to this time. Their bodies are found in "pure clear glacier ice," their flesh preserved; the form of blood globules distinctly seen; the contents of the stomachs undigested, showing that they were overtaken suddenly by the snow that shut them up forever. In one mammal the bulb of the eye was preserved. In another mammal, were found lodged in the cavities of its teeth parts of reeds on which it was feeding when overtaken. The position of these animals, their perfect preservation, their being unaccompanied by drift remains, prove that they were overtaken in a *down-rush of snow* by a sudden and complete destruction. They perished in their grave of snow, which afterwards became glacier ice. As these glaciers retreat northward, their remains are thawed out. They will be found for thousands of years to come. Even the icebergs that break from these glaciers and are borne to warmer climes have been seen to contain the remains of these animals. Now I care not whether the woolly mammal, or other quadruped found under the very Arctic circle, buried in eternal ice, belonged to

the Tertiary age, to Pre-glacial, Inter-glacial or subsequent times. Yet, one thing is indisputable—the animals were destroyed by a *downfall of snows*, and that *downfall* was *sudden*.

The snows that produced the great continental glaciers of North America fell, as is admitted by Dana and other eminent Geologists, upon a continental forest in which the huge mammals of the age lived. Now the excessively slow changes of orbital eccentricity, could they by any possibility supply such a fund of snows, are utterly inadequate to explain the phenomena, as all men—except the wilfully blind—must see. Such a gradual approach of cold must have inevitably dwarfed and depauperated and finally exterminated the extensive forests before such a marvellous accumulation of snow could take possession and become glacier ice, and involve them and their living inhabitants in universal death upon the spot. The animals would have migrated to warmer climes. But their bones are mingled with the trunks and branches of trees of a magnificent forest. The fact that these remains are disjointed and scattered broadcast in the northern drift, shows that they *perished in the great ice field*. But the earth receding gradually into colder heavens cannot by any possibility afford a competent cause for such an accumulation of snows. For thereby it recedes from its very *furnace fire* that alone could supply glacier material. Snows could not increase when the *solar heat* which supplies the vapor is withdrawn! Then whence come that *sudden and universal* down-rush of snows? Nay, I should ask, where else shall we look for the way-marks of that universal fund of snows, or frozen vapors that must have been located on high, so sure as this earth has passed through the reign of fire? The pulverized and striated rocks; the hills pushed aside; the mountains scored and abraided; the lakes filled and valleys obliterated; the earth upturned by this mighty plow of God, are but an outlay of that potential energy stored up in terrestrial vapors in the great alembic of Vulcan, the *molten earth*!

I have now very briefly examined the beginning and the end of the geologic record. I have shown that the waters now on the earth, and those absorbed into its rocky ground, were in the very beginning of the world's history driven into Tellurio-cosmic space and whirled into rotation by inexorable law. Then, by an examination of the Adamite history, I have shown that the last remnant of these waters *fell during the age of man*. Thus the annular theory has two foundations, laid like the grand arch of time. If this condition of things both began and ended the geologic ages, as has been fully admitted, then the *whole fabric* was erected under its influence. The glacial epochs are but one stone in the great building, and the reader can not fail to see how it harmonizes in every particular with the views previously laid down; and now in turn this very dove-tailing evidence, adds strength to the theory itself.

BARNESVILLE, OHIO.

☞ No one should fail to read the special note on last page of cover, first column, at bottom. Our books, and this magazine, are becoming more and more important in the impending crisis of science, philosophy, and religion.

THE PRODIGAL'S RETURN.

TO THE EDITOR:—Aristotle says:—"Define your terms, and discussions will cease." As Dr. Bowie has assumed the defensive, instead of the offensive, and yields to Paracelsus and Haller, the discovery of the law of *similia*, only claiming that Hahnemann merely fitted the theory to every ill that human flesh is heir to, I feel that I ought not to press your courtesy any farther. Since, however, there are a few points in the glittering generalities of the Doctor's attempted reply, which, if not followed out in logical sequence, are apt to deceive the unwary, I beg leave to show up this rather *ad captandum* style of reasoning without a pre-mise.

That no physician before Hahnemann, claimed *similia* to be of universal application, I readily admit. That any physician "at this late day" accepts it, I am sure not even Dr. Bowie will assert. Indeed, how could the Doctor or anyone else, reconcile Hahnemann's cardinal principle that "seven-eighths of all chronic diseases resulted from Psora (itch) being driven inwards," with the statement made by the Doctor that "the true homœopath, relies upon the aid of chemistry, hygiene and surgery? If the law be of universal application, in the cure of disease, and fixed as the laws of the Medes and Persians, why look for anything else? Again: If Hahnemann was a devout student of Nature, why did he go so far out of his way to ridicule the very idea of a *vis medicatrix nature*?

The legend that Hahnemann was inspired—while translating Cullen's *Materia Medica*—to make investigations as to the action of Cinchona, has, like *similia* itself, outlived its usefulness. Indeed it is well known—to those who have passed the dime-novel stage of medical literature, that while a theorist named Brown ("founder" of the Brunonian "system") went before the world as a "stimulist," Tomadini carried out systematically in Italy, the line of practice pursued, if not originated by Haller, dividing his indications into the symptomatic classes—Psora, Sycosis, and diseases caused by medication such as the "heroic" Brown advocated. Surely, Dr. Bowie will not say that Haller "stole" from Hahnemann, whose inspiration was derived, not from Cullen's mistakes, though they were many, but from the discussions being carried on between the great schools of Halle and Edinburgh. These discussions were, as they should be, kept within the profession proper. But Hahnemann, evidently feeling that his stale arguments would meet with but little favor among his medical brethren, appealed to the "dear people"—much after the manner that the "modern thinker," Ingersoll, carries theology into the public prints.

If the Doctor claims for Hahnemann the credit of antagonizing Paracelsus, Brown and other "peculiarists," it only goes to prove that not *similia*, but *contraria* was on the side of the successful one. As to "the traces in all past history, or ages" of the let alone theory, Hahnemann is out-Hahnemanned, by the people of ancient Rome, who, according to Pliny, got along quite comfortably for six hundred years, without a physician of any kind, Julius Cesar being the first one to encourage the man of

healing. In those days of freedom from doctor's bills, the Roman sought aid from Nature through their gods. Thousands of years roll between their day and ours; yet the progressive physician knows that ninety per cent. of his cases will recover from the most serious diseases without any treatment at all, and that in less serious cases, careful nursing makes the mortality almost *nil*. Now, from Dr. Bowie's standpoint—that "nothing succeeds like success,"—the careful nurse, with God's air and sunshine, not forgetting proper alimentation, furnishes us with the truest system of therapeutics, being far in advance of killing time with pellets or dilutions.

Some seven years before I graduated in medicine, I was seized with a desire to test the value of the various remedial agents. As a proprietary as well as practical pharmacist, I had amplest opportunity to follow the bent of my inclinations. After a series of "provings"—running through a number of years—I found that in nearly every case my administration of unmedicated pellets, aided by the label and a lively imagination, with ordinary hygienic precautions, effected the most gratifying cures. On the other hand, it is on record that while the homeopathic physicians were in charge of the San Francisco hospital, the amount of quinine, opium, chloral, etc., consumed was nearly double the amount used by their predecessors.

I congratulate the homeopaths on not being "fools" enough to reject the really scientific, because demonstrable, truths of anatomy, histology, pathology and general hygiene, even from the hands of the "old school." But Dr. Bowie is hitting the "founder" hard in extolling those aids; for it is no secret that Hahnemann utterly abhorred anything of the kind—his "universal" applications of his hobby, *similia*, sufficing for the cure of everything. The Doctor's statement that the "mongrel" or "mixed" system—cursed by the "Messiah of Medicine, during his life-time, and now known as the "pay your money and take your choice" system—should properly be called Eclecticism, is a whopper. It was probably the only way to avoid Scylla and Charybdis; but it is not much to his credit as a medical reader, nor to the Eclectic physician, whose school, as a school, had its first announcement in Cincinnati, in 1845, and whose history before that time, is based on the Thompsonian, or botanical system, and "specific" treatment. But as Eclectics are far more competent to fight the battles of their school than I am, and since I have a lurking suspicion that Dr. Bowie would be glad to have anyone take a share of his already weighty burden, I will leave him alone in this regard, so that he may explain away his gratuitous assumption.

The germ theory, referred to by the Doctor, is, as its name implies, only a theory. Yet, mayhap some eccentric individual may, in a moment of inspiration, proclaim himself as the "founder" of Germopathy; and by putting this and that together, originate a "law." As to the nameless homeopath who has "demonstrated that disease precedes the germ," I feel like exclaiming *excelsior!* For the originality of the demonstration is almost like the "vital theory" of Pasteur. Indeed it is very like demonstrating that while the egg furnishes us

with a chicken, the chicken can demonstrate that, being of the right sex, it can furnish us with an egg, in good time.

In conclusion, I wish to remind the Doctor that we do not seek consultations, because of the thin thread of therapeutics by which homeopathy draws us; but because the followers of this peculiar system yell out humanity(?) as their *argumentum ad hominem*. Surely no good ought to be expected from a consultation of two men holding opinions diametrically opposed to each other. Dr. Bowie says that the regulars come without being asked. This is a fact that is creditable to the physician, if he comes at the call of humanity, upon which the issue is now placed by the homeopaths. But farther than this, I have known not a few cases where the "peculiar" one—fearing that his occupation would be gone were he to be known as a mere physician minus the mystic word homeopath—suddenly avows his intention to be "peculiar" to the end. There are some notable exceptions to this, especially among the younger graduates, who almost invariably select a specialty, thus avoiding the absolute dogmas of the master as well as the use of a now meaningless appellation. When visiting Germany, the home of Hahnemann, some five years since, I was struck with the scarcity of the homeopathic following. At the clinics at Vienna and Berlin, no one was questioned as to what school he belonged—all alike receiving intellectual pabulum from the mother so long forsaken by some of them. Indeed, at times, I could not help likening the return of these medical wanderers to that of the Prodigal son, though in the former case (forgive the seeming levity) the calf was a decidedly lean one. But we were all in love with our profession, and not a few felt that, in this honest searching after truth, the creature, man, was being brought nearer to his Creator—God.

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FREE TRADE AND PROTECTION.

REPLY TO ISAAC HOFFER'S PAPERS.—BY RICHARD LIVSEY.

* * * * * In the first place Mr. Hoffer joins issue with the Hon. D. A. Wells, who says that "Protection takes from one group to give to another." Mr. Hoffer says: "This can only be true when producers are not consumers and consumers not producers; but as all are consumers of cotton, woolen or linen goods, they would all help to pay the twenty per cent. tariff. Hence, there is no oppression of one group for the benefit of another, but a general tax paid by all in as fair a way as taxes are usually paid."

This is a fair sample, neither better nor worse, probably, than the rest of Mr. Hoffer's article and logic! You, Mr. Editor, are accustomed to deal with broken-legged logic, but I venture to say you never met with any as helplessly lame as this.

The Hon. D. A. Wells's statement was of course self-evidently right; for any man, or child even, can see at a glance that the farmers, who are a great majority of the nation, can have no protection by tariffs; inasmuch as their

productions are in excess of our country's wants, and they have to find a market abroad, where our rulers can't raise prices by tariffs.

Now, suppose the producer of cotton goods be also a consumer, as Mr. Hoffer suggests, what then? His income is increased twenty per cent. by the tariff. What is the tax he pays, then, on his consumption? Why, he buys about one per cent. of his income's worth of the goods; and as only twenty per cent. of that one per cent. is duty, he pays a tax upon prices raised by himself of one-fifth of one per cent.—that is the net result of his tax paying by tariff—raising is a gain of nineteen and four-fifths per cent. to himself. Wouldn't all of us like to pay taxes that way? And wouldn't we farmers like to know how it is to be done by us? Now, can Mr. Hoffer tell us farmers how we pay taxes by paying twenty per cent. more for our goods made by native or home manufacturers? We can understand how it is done when the duty is paid upon imported articles, but when we buy the home production, as we do, every cent of the twenty per cent. advanced price goes into the pocket of the home producer and out of ours. If in taking the amount from us the producer could give us a tariff of twenty per cent. back we should be square, but ours is paying without receiving; so *protection does clearly take from one group to give to another*, and it has no other effect. And the man who can't see it at a glance, had better, for his own credit, keep his name from articles saying otherwise.

About two-thirds of the people are farmers, or are identified with farming connections, and therefore can't have any protection by tariff or otherwise. If all were protected alike, none could complain; but as they are not, they justly cry out against protection. Protection is a monopoly like every monopoly. It benefits only when partial, and can only benefit part at the cost of the other part. If we begin to give twenty per cent. all round, we are just the same at the end as we were at the beginning. Try it in a company and see how much more money each will have at the finish.

Protection all round is no more protection than none at all; and partial protection can only be like gaming, taking from one to give to another.

The protected one-third tries to convince us farmers that we benefit by having markets provided by them as a consequence of the tariffs. Well, we can get no more from them than we can by selling in England. The freight to New York is as much as to Liverpool.

Where is the benefit, then? When we sell we don't know whether it be for home consumption or foreign. We can't have a price for each, and the foreign market, that we are compelled to sell in, fixes that one price.

Where, then, is the benefit of giving twenty per cent. to home industry, when that industry pays us no better price than the foreign? And from abroad we can bring merchandise or produce thirty per cent. cheaper than we can produce it at home.

Ought we, then, for purely patriotic and friendly reasons, to pay our own people thirty per cent. more for produce than we can buy for abroad? We farmers can afford to pay freight

to foreign markets, and sell there at a profit in competition with the world; and yet, forsooth, the manufacturers claim they are losing money, or are not gaining any, by being in competition with foreigners in *American markets at home* when the foreigners have paid ten per cent. shipping costs and thirty per cent. tariff to get here! If manufacturers be in the plight they say they are, why not come out of it and go to farming, where an independent, honorable and profitable career may be entered into instead of remaining with a pauperized and begging industry, good for neither themselves nor the country?

The one-third manufacturers may go to farming where there is plenty of room, make profits and wealth therein, leave the country populous and increasing as before; and let foreigners supply us with manufactures at thirty to forty per cent. less price when we take them our produce, so that we need not return with empty ships.


Protectionists think they can by protection do all the manufacturing at home, and have no dealings with foreigners except as sellers. They talk of the cost of carrying goods from country to country, and yet they shut their eyes to the fact that by their policy (if it were practicable) they would take goods to foreigners and wouldn't bring back, thus losing half the cost of the journey by neglecting to bring a cargo of cheap goods back at little cost of freight.

But no nation nor district can do business thus, long. Sellers must buy back, or they will soon lose their customers. No man, community nor nation can buy long if he or they can't sell; and the position of protectionists is, that their non-buying will stop selling and ruin any nation.

When we farmers talk of abolishing tariffs, the manufacturers talk of ruining laborers by exposing them to competition with European pauper labor. The worst paid labor of Europe is farm labor, and American farm laborers are in competition with them without needing or asking for protection. They know they can't have protection any way, and therefore don't ask it; and if manufacturers were put in the same fix, they would soon get as independent. Protection demoralizes and destroys self-respect, and is therefore inadvisable.

Mr. Hoffer talks of agricultural machinery being cheaper here than abroad, and is therefore not raised in price by tariffs, and is better than the foreign too. That is a half-truth which is in reality untruth. From its lightness machinery is cheaper here than heavy foreign would be, but that it is better or as good I utterly deny. With the better, heavier and stronger machinery made by them, foreigners could not compete here, as freights are heavy; and besides, the machinery would not be suitable for the land here. But that tariffs don't make this machinery dearer here, I deny; for the iron is made much dearer by tariffs, and that adds to the price of every machine very considerably.

WYMORE, NEB.

 A GREAT OFFER:—To extend the usefulness of THE MICROCOSM, from this time on, two subscriptions (\$2) at one time, for this vol. from the beginning,—the entire volume will be sent free. This does not apply to the next vol.

NO EXCEPTION TO ELASTIC ACTION.

BY REV. PROF. S. B. GOODENOW.

I showed (MICROCOSM, Oct. p. 76) how elasticity *always doubles*, and never more than doubles the imparted velocity of a body struck.

The query is raised whether this does not depend on the velocity of the striking body? While a given striking velocity elicits in the body struck an elastic velocity which equals and doubles the velocity directly imparted, must not a less striking velocity elicit a less proportion? Answer: It elicits a *less amount* but not a less proportion. The less striking velocity directly imparts less velocity, and elicits less elastic velocity in the *same proportion*; so that this latter still equals and doubles the former.

If a less striking velocity gave a less proportion, then a greater striking velocity would give a greater proportion than double the imparted velocity; and we should have Professor Comstock's absurdity, of limited speed imparting unlimited speed. Or else, nothing but infinite striking velocity could elicit a doubling elastic velocity, and any ordinary velocity would elicit but very slight elastic effect; which is contrary to daily observation.

The truth is best seen by experiment with two equal ivory balls, suspended and made to strike one the other, as noted in the school philosophies. Whatever the swing and velocity of the ball let drop against the other ball at rest, that striking ball imparts all its force and velocity and comes to rest; while the struck ball takes up the whole, and goes just as far as the other ball came (supposing no obstruction from the air). Half the force and velocity is imparted directly, even when the balls are not elastic, so that both balls go half the distance; the other half of the force goes into elastic action (when both balls are perfectly elastic,) carrying the struck ball the other half of the distance, and by reaction neutralizing all motion of the striking ball.

Now, no matter what is the striking ball's velocity, whether slow or fast, that is, whether it be drawn back little or much, the struck ball always responds with that much motion, doubling the half distance that would be made without elasticity (always allowing for the obstructing air). You cannot draw back one ball so little, but that, when let go, it will move the other ball that same little space—at least in a vacuum. The less the striking velocity, the less the resulting velocity of the body struck; but it will be found to be always with elasticity double what it is without, carrying the one ball as far forward as the other ball was drawn back.

If this were true of only one velocity or distance of the ball drawn back, say one inch, and if lessening this distance one half, would lessen the half elastic effect (which we assert) by another extra halving, (as if following the ratio not of momentum but of striking force);—then doubling the distance drawn back to two inches would increase the double elastic effect (which we assert) by another extra doubling, making the struck ball fly off much farther than the striking ball came, and by equal action and reaction, giving the latter a rebound, in-

stead of a state of rest, which is contrary to all observed facts.

If the struck ball could be *entirely free*, without suspension or any impediment to motion, even with no elasticity, its unimpaired velocity, (the half velocity imparted to it), would carry it ahead of the striking ball with its surviving half velocity constantly retarded by suspension. So that when the striking ball came to rest at its half distance, the struck ball would be twice as far away from the striking point; that is, about as far away as elasticity would have brought it if suspended. And with elasticity, bringing the striking ball to rest, the struck ball unimpeded would in the same time go away about *twice* the distance of the suspended swing.

Instead of the striking ball, put the swing of a vibrating prong, and the result must be the same. At its mid-swing, or highest velocity, let the prong strike a rubber ball, of the same mass and perfectly free to move. Even if no elasticity were elicited, the ball, receiving half the force, must move with half the velocity unimpaired, reaching (in the time of swing) twice the distance that the impeded prong will reach,—and cannot "travel along in contact with it," as alleged. Elasticity doubles this distance of the ball, and by re-action prevents any swing of the prong after the stroke.

Thus we see, that it is not necessary (as alleged) for the prong "to indent the ball enough to cause it to re-act and separate itself from actual contact with the slowly moving prong;" for, the suspended prong must come to rest, while the free ball moves unchecked away from it; and elastic indentation only makes this sundering of the two still more decisive. *Perfect elasticity causes full impartation of the whole force to an equal mass struck, leaving the striking mass at rest; and the fact that it stops at once upon striking, is proof that elasticity has transferred all its force.*

This is the law of the action and impartation of force. No teaching of science makes exception or modification for reduced velocity, nor are there any facts indicating such modification. And the principles which are thus true with balls of equal mass, will be found just as true with bodies of any differing weights.

If the rubber ball be *more massive* than the prong, it will take by mere impartation *less* than half the velocity of the prong; but still, elasticity will *double* that less velocity into a motion of the ball less than the whole previous prong motion. If the prong's velocity is small even at first, the velocity given to the enlarged ball is still less; but yet, half of it is due to elasticity. And if, with very slight prong motion against a very large ball, the motion of the latter becomes extremely slight; yet so long as it moves at all, no one can deny that half its motion is from elastic action. Even this makes the elastic action on a massive ball much less than the action of the prong or body striking it, and *less and less as that impinging velocity is less.*

And to say, that a less striking velocity will cause *no* indentation and so elicit *no* elasticity, is the same as to say that the elasticity is not perfect, but has a limit where it ceases to act. We are certainly warranted in insisting, that *perfect* elasticity of both bodies will double the

motion of the body struck. The striking body cannot (as alleged) "move with so little velocity and thus overcome the inertia of the struck mass *so gradually*, as not to compress it or bring its elasticity into play" at all; for the gradualness with which a mass is thus acted on and *actually moved* (as here alleged), only gives the more time for compression and elastic action meanwhile. The same blow which moves the whole mass can certainly indent it slightly to a like rebound.

On the other hand, if the rubber ball be *less massive* than the prong (say, an elastic ball of air), it will take by mere impartation *more* than half the velocity of the prong; and elastic action will double that greater velocity into a motion of the ball *greater* than the whole previous prong motion. For though, as alleged, "it has less inertia to induce indentation, and thus bring into play its elasticity;" yet this reduction of the force imparted and acquired is by a less proportion than the lessening of inertia, while the velocity produced by it increases in full proportion to this very *lessening of the resisting inertia*. Diminishing the momentum or force of a body (whether elastic or other force) by loss of its mass or inertia, does not diminish its velocity; which may on the other hand increase, as in the present case. Confounding *momentum* with *velocity*, is the mistake continually being made.

If the ball's mass or weight be indefinitely smaller than the prong, it being (we will say) an elastic particle of air in a vacuum, then the velocity by mere impartation will be indefinitely near up to the prong's own velocity; and by the doubling elastic action will be indefinitely near up to double the prong's whole velocity at the time of the stroke. Thus, perfect elasticity not only doubles the proportion of the velocity imparted, but also, with infinitesimally small mass struck, it gives double the velocity of the striking mass.

All this does not reach the issue made in the Microcosm, as to the velocity of air-waves; though it does lay the foundation for considering that issue. A ball or particle of air when struck moves along. The question is not how fast or how far it moves, whether just as far as the striking mass, or twice as far; that matters not. But, the question is, how long does it take for the force to pass from the one body to the other?

When the first of a row of balls or of air-particles is struck, the force of the blow is imparted from one ball or particle to another, until the last of the series is moved along. The question is not, how fast or how far does such ball or particle move? which may be a very small velocity. But the question is, how long is the force and effect in reaching from one end to the other of the series? which may show a very rapid rate.

To illustrate: A locomotive backs against a freight train; first one car starts, then the next, and the next, till the last car moves. Now, the point is not how fast each car moves—which may be five feet in five seconds; but how fast the motion is communicated from one car to the next, so as to move the fiftieth car—which may be 2000 feet, in the same five seconds.

This is the question as to air-waves; and this is what needs to be discussed.

BATTLE CREEK, IOWA.

[The most important question to be discussed is, will an air-wave be sent off at all by a body moving in it at the velocity of *only one inch in two years*? See Capt. Carter's Report in last month's Microcosm! A train of cars is a poor illustration for any supposed condensation driven off in a mobile substance like air that is free to circle around the moving body and take its place behind it. Why not take one car 2000 feet long, instead of fifty cars? The motion would then be instantaneous instead of five seconds. The truth is, the whole scientific world, from Tyndall and Helmholtz down to the smallest professor of physics, admits that a body, such as prong or string, must advance "swiftly" through the air in order to drive off a wave or condensed pulse. This is common sense. Yet we know that a fork sounds audibly when its prongs are moving 25,000 times slower than the hour hand of a family clock.—EDITOR.]

THE ORIGIN OF LIFE.

BY PROF. I. L. KEPHART, A. M.

Whence had life, or the life-force, its origin? This is the great question that completely confounds the materialistic scientists of to-day. Before it, all their finely-spun theories fall to the ground. Life exists on this planet. The life-force is the great architect which, out of matter, constructs all organic forms. "Give me matter," said Emanuel Kant, "and I will explain the formation of a world; but give me matter only, and I cannot explain the formation of a caterpillar." Hence, with all the boasted triumphs of materialistic scientists, they are not able to explain even the formation of a caterpillar, much less to account for the existence of the human intellect and the human conscience.

Sir William Thompson ventured to suggest that life on this planet may have been derived from life on some other. But this only transfers the difficulty to another place; for how are we to account for the existence of life anywhere in the universe? According to the nebular hypothesis, which is the very basis of the materialistic evolution theory, all matter once existed in a gaseous state; and Professor Huxley declares that living matter or life could not have existed while all the material of the universe was one seething incandescent mass of gaseous matter.

The above being the admitted declaration of so renowned a materialistic scientist as Professor Huxley, the question arises, how can Prof. Tyndall place this assertion of his great coadjutor side by side with the declaration of Kant as given above, and then find in matter alone "the promise and potency of all terrestrial life?" He credits "pure matter with the astonishing building power displayed in crystals, and trees," but he fails to tell us from whence "pure matter" derives this "astonishing building power." He claims to be truly scientific, and to adhere strictly to the scientific method; and yet he leaves between Kant's and Huxley's declarations on the one side, and his own "aston-

ishing building power" of matter, on the other side, an immense chasm unbridged even by anything like a plausible speculation. This he does, and still lays claim to being truly scientific; and chimes in with that class of materialists who pretend to look with pity and contempt upon "unscientific theologians who are deceived by the acts of a blind automatic force in Nature which, to the uninitiated, are indicative of design, but which, in reality, are only a bit of their anthropomorphic theism."

Every observer recognizes the fact that, in Nature, there is that which knows and that which is known—that which uses and that which is used. These are distinct and separate existences; they are not one and the same thing. The intelligent life-force which out of two atoms of protoplasm which, as far as the most careful inspection can discern, are exactly alike in their constituent elements, builds from the one a jelly-fish and from the other a man, by what it does convincingly declares that it is a something distinct from the material out of which it builds,—that it is infinitely superior to the material elements that compose the protoplasm. It is for the materialistic scientist who denies the existence of a superior *spiritual* intelligence to account for these wonderful results in Nature, and to do so in strict accordance with the scientific method, or to admit the plausibility of the theistic hypothesis. Their "unknowable" theory miserably fails to satisfy inquiring minds. It is a fact that life and thought and conscience do exist. Huxley declares the time was when none of these existed in matter. If matter, according to Tyndall, contains them now, let scientists tell us, *scientifically*, just how this wonderful acquisition has been secured. How is it that what was once dead matter has been awakened or wrought up to the noblest manifestations of thought and feeling? Is it the result of nothing more than that intelligence which sleeps in its own atoms? and has the result, the life and thought, been simply evoked from matter by a happy combination, or an accidental, but very fortunate stroke? If so, let materialists, adhering to the scientific method, demonstrate the fact, and "unscientific theologians" will accept the result and do homage to the *fact, when once demonstrated* to be such. Let the mysterious process of growth from the seed to the plant and the embryo to the perfect animal be scientifically accounted for as only material combinations, and in no way the result of intelligent direction or supervision; let it be clearly proven that many so-called species have originated from a simpler form; let zoologists and palæontologists be brought to accept as a demonstrated *fact* of science that a law of progress can be traced from simpler to more complex forms of life, from the fossil period down to the present forms; let these claims be sustained by the demonstrated *facts* of science, and "unscientific theologians" will accept the results. But so long as they are, as now, only the speculations of materialistic atheism, theologians prefer to stand with the feet of their faith on the Bible rock.

These materialistic atheists can see in the growing seed a sufficient substitute for creative force. With them an unthinking tendency in

matter to "variation," coupled with an equally blind tendency to "conservation" is all that is necessary to account for the existence of life and thought. With them star-dust, "rushing from a rarer to a denser medium, is deemed the only, and the ample, explanation of the structure of the planetary system, of the production of air and water and earth, of the production of animal and vegetable life, of the manipulation of sensitive, intellectual, and spiritual activity, of conscience, law, and religion!" Is it, then, evidence of stupidity or mental obtuseness on the part of "unscientific theologians" to refuse to accept, as conclusive, these mere speculations, before they, by a strict adherence to the scientific method, are demonstrated to be facts? We submit that, in view of the inestimable value of the interests involved, it is not—materialistic scientists themselves being judges.

PHYSICAL LAW.

BY REV. THOMAS M. WALKER.

We are met at every turn, in our investigations of phenomena of the material world, by the word Law or some equivalent that indicates a power behind the scene that determines, in every instance, both what is, and what is to be. If a stone lies motionless, or if its hold is broken and it bounds from the top of the mountain to the valley below, it is by law. The tornado, the pestilence, and earthquake; the mighty movements of innumerable worlds and the bursting of a bubble, are all from the operation of physical law. It is not, then, an unimportant question that we ask. What is Law, as it is recognized in the material world? The answer might be that it is a principle, a force, an energy—words not strictly synonymous, but often used interchangeably; such an answer, however, only provokes the questions, What is a principle? What is a force? What is an energy? Is the philosophical and scientific world content to take the existence of physical laws for granted, and when investigators meet with their results do they simply bow to them as something unknown and whose acquaintance they do not care to cultivate? Such taking for granted is certainly neither philosophical nor scientific. While scientists are patiently pushing their investigations into every department of the material and immaterial world, why not give time and thought to law itself, by which all phenomena are brought about and all things consist? Take the great law of attraction, as a sample, and what is it? Is it a nonentitative abstraction, like the precept "Thou shalt not steal?" If so, it has no more power to move a feather than the precept against theft has to hold back the hands of a thief when it is in his heart and in his power to steal. When Christ said to the Sea, "Peace, be still," He uttered a law to the elements there; but the winds and the waves did not hear, and did not will to obey, having neither hearing nor the power of volition. But there was then, notwithstanding, something that stilled the tempest; and though there is something that with marvelous skill builds the organisms of Nature and repairs their wastes; that controls every movement of the hosts of heaven, and holds the atoms of the universe

together; What is it? Professor Tyndall says that he sees the Promise and Potency of all life in matter. The Professor has, no doubt, with the aid of the microscope, seen far down into its divisibility; but we doubt whether even there he has seen anything other than dead, inert matter. From this point he probably, in his imagination, sees its ultimate atoms, and thinks that he sees them in great activity, furiously bombarding each other and the sides of the little space that they occupy. But why are these little atoms restless? It is from a law of their being. Is it this, then, that Prof. Tyndall sees? If so, he certainly sees just what we want, viz.: Energy, or the first cause of all activity, and he will confer a favor on the world by telling us just what it is, and how it knows how to shoot so vigorously. But as this information is not given, we are left just where we started with the question:—What is physical law, or force, or energy, as it may be called? Is it an entity? And are all the laws and forces of Nature so many entitative existences? If so then we have, taking the great law of attraction as a sample, a substance as real as mind or matter. A substance, in the atheistic view, that exists without a Creator and hence from eternity;—a substance that is omnipresent and unchangeable and that acts, and acts with absolute precision and uniformity; acting perpetually and under endless modifications and complications, and yet never fails and is without the shadow of error. A question here is unavoidable, Does this substance possess intelligence? If not, can our philosophers give the shadow of an explanation how, blind and senseless as it is, it can act with absolute precision and uniformity, leaving never a trace of error in its track in all the past? All force is directed either by intelligence or chance, no other supposition is possible. By which of these, then, are the forces of Nature directed? Will an answer be ventured? Let the answer to this be as it may, the fact remains that the atheist embraces in his creed more gods than Greece and Rome ever boasted of. He may call them laws, but they have all the requisites of divinities—uncreated, eternal, omnipresent, omnipotent and wise. Why not call them gods and build to them temples and altars, and institute rites of worship? But none, I believe, ascribe to these forces intelligence. Then the atheist is worse in his idolatry than the Hindoo. The Hindoo believes that the wooden block that he worships has in connection with the material a thinking, feeling, knowing substance. But the atheist's god—law or force—puts forth actions wonderfully intelligent, and yet has no more intellect than the naked stock that the Hindoo worships. The conception that seems to be general on this subject is nebulous and indefinite in the extreme, but if formulated would be this: There is a God of infinite intelligence and power that has brought the worlds into existence, but has done as little of the work of creation personally as possible; but has, instead, created laws or demi-gods who finish up the work and rule over it afterwards, God Himself being either unable or unwilling, on any account, to interfere. This is scarcely better than the atheist's uncreated omnipotent laws. It simply changes the ground from the poly-

theism of the West to that of the East, giving us our Supreme God, but in a state of repose, with inferior gods of every kind and degree that do the work of managing the world. But again, the materialistic theory that prevails among unbelieving philosophers is, that mind and the other forces of Nature are not separate existences but adhere to matter itself, either as qualities like extension and divisibility, or grow out of the relation of particles of matter to each other, or is some mysterious mode of motion. But one of these theories is about as absurd as the others, and none of them have a known fact on which to rest. Can a simple quality, like white or black, perform all the work that the human mind is capable of and in any way or degree, govern the world? No one can believe it. And again, is the mind of man with all its powers and capacities, and likewise are all the forces and laws of Nature the result of material atoms variously arranged? This requires only to be stated, in order to read the answer. Place two atoms side by side and they give nothing; but place one above the other and they give mind. This is the principle. Or, if you please, arrange ten or a million atoms, it will still remain that mind, for, example, depends on the arrangement of dead matter for its existence and character like arranging pieces on a chess board. If again, mind, one of the acknowledged forces of Nature, is a mode of motion, we ask: What is it that moves? Or is it some kind of motion where there is nothing that moves? Or is it Prof. Tyndall's gelatinous, luminiferous ether? Or is it the solid matter of the brain that moves—grinding out consciousness, and feeling like a mill, only creating the grain that it grinds? Or rather the motion of the mill itself, being both the grain and its product? And who creates and sustains and changes this wonderful motion so that sometimes it grinds out philosophy, and sometimes poetry, and sometimes mathematics, and sometimes nonsense? We might well, in view of this whole subject, use the petition of the old Prayer Book, "From materialism, from atheism, and from all forms of infidelity good Lord deliver us."

Upon no known principle can the phenomena of Nature be explained, except by attributing all to the omnipresent energy of mind. In this we need not inquire into the mysteries of mind, nor how it can control matter. We simply know that it can do this, from perpetual experience and observation. Our hand lifts from our side. We know that it is from the energy of will directed by intelligence. The mind determines the kind and degree of motion, and in obedience the will moves the arm and thus suspends or overcomes the physical laws that should bring it down. Our mind, we know, controls matter as far as its jurisdiction extends, which is, directly, to a certain extent, the body that it inhabits, and indirectly through this body it can make its power felt on anything on the face of the earth. From this, it is unavoidably inferred that the infinite mind of God can control, at His pleasure, either directly or indirectly, all material things. Why not, then, adopt in full the definition of the renowned jurist Blackstone, that law is a rule of action? It is not a rule for atoms and worlds to obey; for as dead matter they could never

know of the existence of these laws, much less will to obey them. The laws of Nature are simply rules that God has prescribed for His own action in the government of the world, and from which He does not choose to deviate at any time or place, unless for reasons that in His estimation are worthy. This being so the healing of the leper and raising the dead are not more impossible or wonderful than the falling of a leaf or the rising of the sun. In the one, God works according to, and in the other, aside from these rules. This gives a unity and grandeur to the universe, that no other conception can. It is at the same time evident that, ordinarily, God works by instruments of His own creation. Some of these are what are known as the imponderable agents of chemistry—as light, heat, electricity, magnetism, and likewise animal instinct, and in some sense even intelligent reason. We can readily understand how these things are instruments under the control of intelligence. But we can no more conceive of their exerting force independent of a living will, than we can conceive of the ax of the woodman leveling the forest without the intelligence and will of the ax-man. Take electricity as an example, and suppose from a battery of sufficient capacity a circuit of one hundred miles of wire is attached with telegraphic instruments placed at various points. There is a break of half an inch at the farther end. The electricity will not move one line while in that condition; every instrument will remain silent. But close the circuit and the electricity will instantly leap through the whole extent of wire, and every instrument will click to its influence. What impelled the electricity through the wire? It certainly did not know when the circuit was closed. But there was intelligence somewhere that cannot be attributed to either the wire, or the instrument, or the fluid. Or take the law of attraction. A stone falls to the ground. In explanation we say, that it was attracted by the earth. We are justified in speaking thus, just as we are in saying that the sun rises and sets—because it corresponds with appearances. But it is no more scientific in the one case than in the other. A school-boy might say that the earth does not know that the stone is in existence, and the stone does not know that the earth exists. Neither of them had a desire to come together, neither of them had the power of volition, nor have they even organs through which to act; and gravity, if an independent substance, is just as ignorant and helpless as the other two. Who could show that this school-boy is in error?

Any occurrence without intelligence must fall out strictly by chance, and in chance there can be no uniformity. The intelligence and will that causes the stone to move downward, instead of upward, or stand still, can be none other than the intelligence and will of God acting according to a rule which He has prescribed for Himself. And so all that we call law, or principle, or force, or energy, in the material world, except what may be put forth by created intelligence, is the will of God acting with or without instruments as He sees best.

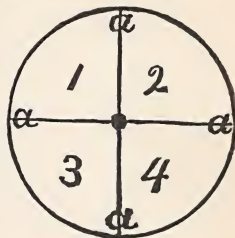
FOUNTAIN GREEN, ILL.

SUICIDE OF THE WAVE-THEORY.

THE CHLADNI PLATES.

BY CAPT. R. KELSO CARTER.

A round plate of brass, supported on a standard in the center, will, when rasped with a violin bow, divide into four or more vibrating sectors. By sprinkling sand upon the plate, these sectors are beautifully exhibited, by the sand-particles arranging themselves along the nodal lines, *a, a, a, a*. This instrument affords one of the strongest proofs of the "interference" of the wave-theory that has ever been advanced by any authority on sound. A careful reading of this article will show, first, that the very nature of the experiment is absolutely fatal to the wave-theory itself; and second, that the explanations given, dependent upon that theory, are utterly without any foundation in fact.



First, then, let us see the suicidal nature of the Chladni plate, as an experiment to substantiate the wave-theory. It is a fact, undoubtedly, that when sectors 2 and 3 move down, sectors 1 and 4 move up—thus alternately vibrating and balancing each other. When 1 goes down, 2 goes up, and *vice versa*. Now, if we are above the plate, we will say with Professor Tyndall, that sector number 2 in coming up toward us, produces a condensed pulse. At the same instant No. 1 is going down, and produces a rarefaction. In this, Prof. Tyndall agrees. (See page 270 of his work on Sound). But the Professor goes too far for his theory, for he actually says:

"Hence, at the moment when any one of the sectors produces a condensation in the air above it, the adjacent sector produces a rarefaction *in the same air*. Interference, and a *partial* destruction of the sound of one sector by the other is the result."

It is only necessary to hold him rigidly to his own language to show demonstratively that such a plate cannot sound at all, because one-half of it is making condensations, and the other half rarefactions "*in the same air*," at the same instant. But we will not insist too strongly, but will rather venture to assist the Professor by suggesting that "the same air" cannot possibly be over two sectors at the same time, if the foundation axioms of philosophy be correct. However, it is certainly true that these opposite effects are being produced, and with equal force; hence it does most absolutely follow, that no sound whatever should be heard, in a line directly above the center of the plate, at any convenient distance from it. Lest this fact should not appear axiomatic of itself, we thought of the expedient of confining the vibrations to the column of air directly above the plate. In order to do this we took a large glass funnel, connected a flexible rubber tube with it, and passed the rubber hose through a door. An assistant held the funnel close over the plate, *inclosing it entirely*, and

we listened in the next room. Certainly there should have been no sound, or at least a very weak one; but our ears would tell the truth. The sound was full and strong.

This was tried thoroughly and exhaustively. According to Tyndall, the four or six sectors were producing waves or pulses in the air contained in the funnel. One-half of these pulses were condensations, while the other half were rarefactions. It was, therefore, absolutely clear that the "same air" was subjected to precisely opposite impulses, equal in number and intensity, and therefore the total effect should be absolute silence. But we need not go so far with the experiment. Leave off the funnel, and tube, and rest the whole case on the plate in the open air. Here is the plate of brass, cut to a true circle, and clamped fast at the centre. I rasp it with a violin bow and it divides into four vibrating sectors, which are in two equal sets, diametrically opposed. The funnel is not needed, for Prof. Tyndall himself insists that these opposite effects are produced in the "same air," and "at the same moment." Now that learned exponent of the wave-theory informs us that the "total silence" (?) of the fork held cornerwise, is due to the fact that the opposing vibrations from the two prongs do absolutely extinguish each other along the line of meeting. But in the case of the plate, this ought to be even more evident. The plate is one smooth flat surface from which the air-waves, if such exist, are propelled equally and smoothly. There are no openings in the plate as between the fork prongs; hence it is a matter of demonstration that every particle of air above the plate is included in the effect of its vibrations. This being true, and who will dare deny it, it is conclusively proved that the silence line above the Chladni plate will be found right on the axis of that plate; that is on a line perpendicular to the centre. Let any believer in the wave-theory hold a vibrating plate opposite to his ear, at various distances, and diligently hunt for a place where he can say, as Tyndall does of the fork, "the sound is totally extinguished." When he has found it, he will have resurrected a corpse. The claim might be made that the plate is not symmetrically divided, and therefore that the sound is only "partially destroyed;" but the plates are guaranteed by the maker to be homogeneous, and the sprinkled sand shows clearly that the divisions are symmetrical. Most conclusive of all, the very place to search for a "partial destruction" would be along the line perpendicular to the centre of the plate; but alas for the theory, that is the very line along which the sound is loudest of all. If there was the veriest shadow of truth in the theory, it is absolutely certain that some slight weakening of the sound would occur when the ear is held perpendicular to the face of the plate. There is no use in attempting to avoid this; it is positively demonstrated beyond any question, by the very nature of the circumstances and of the wave-theory. But this position of the ear secures the very loudest, fullest sound that can be possibly heard from the plate. It is a case of scientific suicide, pure and simple.

Again, Prof. Tyndall never thought of the under side of the plate, any more than he did of the other face of the fork prong. That under

side of sector number 2, of course, produces a condensation while the upper side is producing a rarefaction, and *vice versa*; and the same is the case with each sector. Consequently a condensing and rarefying is going on continually, only separated by the thin brass plate, and, using his language, we might say, "in the same air." The argument just used for adjacent sectors can be applied equally to the opposite side of one sector. In fact, as we conclusively showed in Nov. 1882, just here lies the great primal and fundamental absurdity underlying the entire wave-theory of sound. The upper face of a brass plate is making a "condensed pulse," while the opposite or under face is producing a "rarefied pulse," at the identical instant of time, and only separated by a distance of one eighth of an inch. Prof. Tyndall even assures us that each of these pulses immediately "spreads all around" the vibrating metal, and Prof. Mayer actually calls a portion of a dotted circle, "a condensation," and the rest of the *very same circle*, a "rarefaction," while also informing us that each "spreads all around." Hence the same circle of air is, at one and the same instant, condensed and rarefied; and therefore there is no sound at all, or else the wave-theory is a hopeless fraud. We insist upon it that no attempt to bolster up the old theory is of any avail, unless this *fundamental error* can be settled. Sane men undertake to claim that the wave-theory, in its real essence, has reference to the number of vibrations, not to their velocity; and that a stated number of vibrations in the instrument will produce the same number of vibrations in the atmosphere—the velocity in air being a fact just as the velocity in water or iron, and not at all dependent upon the velocity of the sounding body. Of course it can be easily shown that this is a bare-faced attempt to steal Wilford Hall's thunder right out of his own hands. But setting that aside, the wave-theorist gains nothing at all. He still claims that the vibrations of the instrument actually produce the vibrations in the air by direct contact; that a forward motion of the fork or plate, causes a condensation in the air; and a retrograde motion, a rarefaction. We can absolutely spike the big gun of the velocity question, stupendous as it is, and face the wave-theory on any ground it may choose to steal. The unquestionable fact remains that the "*same air*" is condensed by one side of the plate, and rarefied by the other side at *precisely the same instant*; and the whole teaching and principles of mechanics, as well as the wave-theory itself, are summoned to testify that when a particle of matter is acted upon by two equal and opposite forces, it remains absolutely at rest. Therefore, there is no sound at all.

And just here, be it noticed, that the question of symmetry is absolutely silenced; for it is evident that the effect produced by one side of a sector is precisely equal to that caused by the other side of the same sector. Now as the whole is equal to the sum of all its parts, it follows beyond any dispute, that the total effect of one side of the whole plate exactly equals that of the other side (of course a fork prong shows the same), and these two total effects are directly opposed.

Nothing has been misrepresented in this arti-

cle, nor has the language of the wave-theorist been twisted in the least from its plain and evident meaning. There is, indeed, no need to go to their language at all. The very nature of the case is enough. One side of a plate, fork, string, bell, rod, or other vibrating body produces a force in one direction upon the atmosphere, while at the very instant, the other side exerts a precisely equal force in exactly the opposite direction. Consequently the particles so acted on remain at rest, and no sound can possibly be produced. This is the wave-theory. Fact steps in and says that sound is produced. Therefore the proposition is demonstrated: *the wave-theory, in itself by its own requirements, deliberately commits suicide.* But let us now seek the true explanation of the facts in the case of the Chladni plates.

PENNA. MIL. ACADEMY, CHESTER.
(To be continued.)

RAREFIED vs. CONDENSED.

BY PROF. C. W. THOMPSON.

As an evidence of the dilemma in which the "Problem" and Microcosm have placed the advocates of the wave-theory, consider the following quotation from Cooley's Philosophy, page 158. Prof. Cooley says: "An air-wave consists of two parts, a condensation and a rarefaction." And he illustrates it as follows:—

"Let a few grains of gunpowder be exploded. A little sphere of air at the point where the explosion occurs, will be, for the moment, rarefied, while by its pressure a shell of air outside of it will be condensed."

If it be true as the Professor says, that "a little sphere of the air at the point where the explosion occurs will be, for the moment, rarefied," the question occurs, where is the volume of gas instantaneously generated by this explosion? Why did Prof. Cooley maintain such an ominous silence in regard to the gas generated? Was this "silence" a case of interference? We have, several times, struggled to form a mental concept of this "little sphere of rarefied air," but it persistently refuses to con-*cept*. We are inclined to believe that (under the conditions the Professor has supposed) his "little sphere of rarefied air" is not there. It seems more reasonable to believe, that the gas generated will, "for the moment, and at the point where the explosion occurs," exist and fill such a space to the utter exclusion of every particle of air. Still, admitting that Prof. Cooley's "little sphere of rarefied air" is really there. What then? He says, "by its pressure a shell, of air outside of it will be condensed." Now, while this "little sphere of rarefied air" is exerting upon the outside air a condensing pressure, what has become of the expansive or spring power of the outside, or normal air? Has the sound-wave so shocked its sense of propriety, that this outside air, is temporarily rendered incompetent to exert its power of reaction? Prof. Cooley probably furnishes the first instance, of a modern scientist teaching that rarefied air is capable of exerting a greater pressure than normal air. It is hard to decide whether the foregoing quotation is a rarefied condensation, a condensed rarefaction, or, a rare condensation of scientific bosh. If Professor Cooley will keep a *sharp* eye on Substantialism, he will

learn after a little that it will only take "a few grains of gunpowder" to explode his hypothetical illustration. In a future article I will present some thoughts on the principle in Physics known as "The mechanical equivalent of heat."

BLUE MILLS, MO.

A NEW THEORY.

(From *The Age of Progress*.)

"We learn from WILFORD'S MICROCOSM for December, by a communication from a Mr. Clark, that on the day of the late Java earthquake sounds like thunder claps were heard near El Paso, Texas, suggesting some possible connection. The writer remembers hearing similar sounds in Texas not long after the Mexican war, knowing at the time there were no cannon within at least a hundred and fifty miles and the heavens entirely free—as they had been for months—from any appearance of clouds. He has often thought of this matter since and is pleased with the scientific explanation now given by the editor of this philosophical journal to Mr. Clark. The substance of the explanation is, that the earth's central portion under the exterior crust being a fluid mass, may be surrounded by an atmosphere denser than ours, into which there are projections from the inner side of this crust, and the Java disturbance might have produced electrical discharges which struck around the earth in this inner atmosphere, dislodging projections under the earth's crust in Texas, producing these sounds as the noise of thunder. The unexplained noises heard by the writer (if he could fix the date), would not unlikely find in the past history of the Java volcanic region a confirmation of this theory."

"EVOLUTION AND REVOLUTION."

Henry Ward Beecher is still lecturing on the evolution theory all over the country, repeating his stale and already thread-bare platitudes which have disgusted so many Christian audiences that have gone to hear him out of curiosity, mingled with pity. He lectured recently in Chester, Pa., and repeated his principal joke that he would "as lief be a descendant of a monkey as of a mudhole." One of the clergymen of Chester in reviewing his lecture curtly replied, that if evolution were true, Mr. Beecher could have no choice in the matter, between the monkey and the mudhole, as the latter was self-evident; and that the former ought not to be true, as it would forever ruin the reputation of the monkey.

REV. MR. WALKER ON PHYSICAL LAW.

We cannot help calling attention to the admirable discussion of "Physical Law," by the above-named able writer in this number of THE MICROCOSM. Indeed, we regard his paper as one of the most timely and powerful arguments in support of theistic personality, and in refutation of atheistic, blind, and mindless chance, we have ever read in so short a compass. We feel sure that no skeptic, if sincere and intelligent, can rise from a careful study of that less than two-page article without feeling extremely skeptical about his own skepticism. Our readers will look with interest for other contributions from the same logical pen.

WILFORD'S MICROCOSM.

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 Prof. M. DOZIER, A. M. Santa Rosa, Cal.
 Rev. S. C. LITTLEPAGE, D. D. Fairfield, Tex.
 Prof. H. S. SCHELL, A. M. New York
 Rev. J. W. ROBERTS. Oskaloosa, Kan.
 Rev. THOMAS NIELD. Elmira, Mich.
 Prof. G. R. HAND. Sacramento, Cal.
 RICHARD LIVSEY. Wymore, Neb.
 Rev. THOMAS M. WALKER. Fountain Green, Ill.
 Rev. Prof. S. B. GOODENOW. Battle Creek, Iowa.

SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

THEISTIC EVOLUTION.

REPLY TO PROF. A. C. FERRIN, A. B.

We cannot too heartily commend the frank and outspoken manner of Prof. Ferrin in his plea for theistic evolution, which we print elsewhere in this number of THE MICROCOSM; and we request each reader carefully to peruse the professor's paper before proceeding with this reply.

We have for some time desired a full and clear statement of theistic evolution, from some one of its adherents and advocates for publication in this magazine, that we might carefully examine and reply to it for the benefit of our readers. We have even written to some of its advocates for a concise exposition of its principles, and a statement of the grounds upon which it rests its claims. But we have received nothing upon the subject, until the present. We congratulate Prof. Ferrin, and our readers upon the calm and dispassionate manner in which he enters into the discussion, and the remarkable conciseness with which he goes over the entire ground—condensing every essential point in the controversy into the smallest possible compass.

Of course we will not try to disguise the fact, out of friendship for the Professor, that we deny in toto the evolution hypothesis, theistic, atheistic, or agnostic; especially do we discard theistic evolution, so clearly outlined, and urged by our able contributor, as inconsistent, self-nugatory, and entirely unnecessary in the Divine order of things. We have already replied, at length, to the Darwinian view of development in the *Problem of Human Life*, and have also touched slightly upon the theistic aspect of the question, as held and taught by Prof. Asa Gray, Joseph Cook, and Dr. McCosh. But we now come to the gist of this latter branch of the controversy by the fortunate opportunity of possessing Prof. Ferrin's article for a text.

There is no misapprehending the Professor's position, as he so clearly gives it, namely: that theistic evolution is simply Darwinism, for all animal species up to the creation of man; and even then it is still simple Darwinism, so far as man's perfectly formed body is concerned, with all its organic functions and physical capabilities complete. All these, including the upright position, the massive brain, the expressive features, etc., etc., peculiar to man's corporeal organism, were direct, but gradual results of evolution from the next lower forms of animal life,—the monkey or ape family,—though the higher links in this physical chain

of anthropoid development approaching the upright form of man, he agrees with Darwin have not yet been found, either living or fossilized. But this fact he thinks does not disprove the existence of such missing links. He holds with Darwin that the ape progeny really continued on developing physically till a perfect physical man was reached, as the suitable recipient of a rational human soul and immortal spirit, and that man's creation, as described in Genesis, consisted alone in the miraculous inbreathing of his soul or spirit by the direct act of God into the perfect form of a highly developed baboon. Of course all the talk in Genesis about making man's body of the dust of the ground, or making Eve's body out of a part of man's, is but metaphorical with Prof. Ferrin, and goes for poetry. But why this should be poetical, and the breathing of a human soul into man's nostrils should be taken literally, is scarcely clear to a beginner in the science of theistic evolution. Especially is it not clear, when the *creation* of "man," and the *creation* of "great whales" (verses 21 and 27, Gen. 1), are expressed in the same Hebrew word, *bārā*, as all scholars admit. Nor do we see how the fact that the earth and the waters were commanded to bring forth the animals, and vegetables after their kind, avoids the fact of special creation for their first pairs, any more than for man, since the very first animal had to be created directly by an act of God before the earth could begin to bring forth anything,—according to Darwin, and all theistic evolutionists. We thus see that as the earth could bring forth other individuals of this first species without involving a denial of the direct creation of the parents, as Prof. Ferrin would admit, so could the first pair of every species just as well be a direct creation, and the earth still bring the offspring forth subsequently as Genesis records it. Either this, or a total denial with Hæckel and Huxley that an intelligent God had anything to do with making the first few simple animals from which all other animals, including man, evolved; and thus we would have to fall back with Hæckel and Huxley upon the Spontaneous-Generation hypothesis, for the commencement of life upon this earth.

We here see that theistic evolutionists have a difficult time of it at the start, if they even attempt to reconcile the first chapter of Genesis with anything save the direct creation of the first pair of every animal species as well as the first pair of the human race. The earth now brings forth the posterity of the first man and woman under the settled laws of Nature the same as it brings forth the posterity of the first animal pair

according to evolution directly created, provided it still exists, or any other animal pair now within our observation. Any superiority, therefore, which man possesses over the lower tribes of animals, is clearly by virtue of his creation, soul, body, and spirit, in the image of God. To our mind it seems childish in the extreme to believe that God would providentially supervise and watch over the evolution of man from a worm by almost infinitely slow and diversified stages of development, and through countless ages of time up to his perfect bodily form and contour, yet all the time simply a brute-beast, and then stop short and finish out man's intellectual development by a *miracle*,—the only one He had wrought for millions of years, though specially watching over man's body! If it really was, as Darwin and his theistic disciples claim, far more ennobling in the character of God to slowly enoble all animals with their marvelous mental powers from a single simple form of life or a few forms, than to create the first pairs of the different species separately and directly, then why would it not have been still more ennobling to the character of the Creator to have kept on with the evolutionary process that had developed the surprising cunning of the ape from the almost lifeless sponge, and evolved man's immortal soul from his animal soul, rather than abruptly changing a process, that had wrought so well for so long a time?

Now we have not misrepresented Prof. Ferrin as to his exposition of theistic evolution. His position is that the entire animal kingdom up to and including man's physical organism, is the result of evolution from lower animals; and that when God found this physical man, or man's perfect body brought forth by the laws of Nature ready to His hand, He took one male specimen of such improved ape and breathed into his nostrils the soul or spirit which made a man of him in the moral, mental, and spiritual sense of the term. Of course He must also have breathed into a female specimen of the same highly developed ape-tribe making her the Eve of the Bible just as the other specimen had constituted the Adam. This, as we understand our contributor, made no change whatever in man's or woman's body or brain: it was simply implanting by miraculous interposition, a human soul and intellect into an animal body which was only that of a brute to all intents and purposes up to the time of this implantation. Then we fail to comprehend why this ape-body, as the mere tenement of the human soul, should be any better when the soul leaves it at death than would one of the other ape-bodies of the same tribe and of precisely the

same form and structure, and which must remain exactly the same after death as if it had carried a soul during its physical sojourn.

Neither do we see why one is not entitled to a bodily resurrection as well as the other. Besides this, we are puzzled to conceive why evolution should cease in the development of this species of normal 'man-ape, minus soul, just because one of that highly organized and highly favored tribe had been selected in the Garden of Eden as the recipient of a human spirit? We can see why this humanized ape should stop evolving morally or spiritually after being humanized with a soul, having a complete outfit of intellectual or spiritual powers given to him at once by which he was made into the image of God. But it is strange, to say the least, that the entire species of this man-ape, with perfect human bodies and fully developed brains, should not only cease to evolve into still higher physical, mental, and instinctive perfection as soon as a single pair of them happened to be selected for human souls, but that this whole tribe of men and women minus souls, that had so successfully survived, should cease to exist or should become extinct so that not a single specimen living or fossilized has ever been found! If it was by Darwin's law of "survival of the fittest," and by which the superior forms as he tells us, "exterminate the inferior," it is not saying very much for the human souls and other *moral* and spiritual faculties breathed into the two select human apes that became Adam and Eve! Possibly, and as a relief to Brother Ferrin from this logical difficulty, and without knowing the complexion of his social politics, it might help his theistic theory to assume the Negro race as identical with that soulless human ape-tribe with perfect human bodies, and that the miraculous inbreathing process by which two of them received souls also might at the same time have turned them white! We like to help whenever we can.

But it is a well-known fact that the farther we trace the monkey or ape line upward from the lemur to the chimpanzee, and the more nearly it is developed into form, size of brain, &c., to the upright stature and lineaments of man (supposing it to have been by development instead of direct creation), the more advanced also do we find the instincts or mental powers of the individuals constituting this ape-family. This being so, then if the higher monkey species had really kept on evolving, as Prof. Ferrin claims, till they had attained the perfect bodily form of man with his massive brain, &c., it is quite natural to suppose that their mental powers would have increased proportionately above those of the highest form of the present ape-family. How much such increase would have

fallen short of the actual mental powers of the lowest of the human species—the Hottentot or South-Sea Islander for example—we leave for evolution naturalists of the theistic order to determine. For our part, if we believed with Prof. Ferrin that all apes are evolutions from lower animal forms, and these from still lower down to cytods and monera which exhibit but the first signs of animal instinct or mental powers, we should not stop with the evolutionary development of man's perfect *body* from that of an anthropoid ape, but would believe with Darwin and without a moment's hesitation that his soul and spirit also came from the same source and in the same manner, namely, by evolution, just as do Hæckel and Huxley; and that a personal God had no more to do in changing such a well-developed ape into a human being than He had in changing a jackal into a fox, or a dog into a babboon. We see, in fact, much more difference between the mental powers of an orang outang and those of an ascidian or moneron, than we do between the instinct of this anthropoid ape and the mind of the lowest savage; and if the ape as now seen, with all its mental cunning, has been really capable of still further development by evolution into a perfectly formed man, physically, with his massive brain and with the necessary mental advancement which that degree of cranial development implies, the assumption of any necessity for miraculous interposition to finish the work of man's development is, to our mind, simply absurd. How a man of Prof. Ferrin's reasoning powers can believe in the evolution of all species of animals up to man's perfected body and brain from an original sponge or speck of protoplasm all by the unaided laws of Nature, then stop short and insist upon a single miraculous interference on the part of a personal God in order to complete man's intellectual nature, is a mystery which we fail to unravel. No wonder that atheists of the Hæckel and Huxley school laugh at the plea for theistic evolution! They even repudiate Darwin's mild concession of the necessity of a God for the original direct creation of the lowest form of animal life from which to evolve the higher forms by natural selection and survival of the fittest, claiming that the laws which could develop the mental powers of a monkey or man's physical structure from a flake of ocean slime could also bring forth that flake by spontaneous generation. We say unhesitatingly *amen* to this reasoning, and pronounce it the only consistent view permissible according to the true evolution theory. We believe that the same power and process that gave man his soul and intellectual faculties gave him also at the same time his massive brain, adapted to fit

his mental powers, and that He also gave to him his upright form as a typical reminder of his high order of spiritual being with a moral nature made in the image of God. It is hardly reasonable to suppose that God should, during millions of years, have developed a species of beasts by evolution into the perfect form of man, with massive brain many times too large for their intellects and not adapted to their souls, as Prof. Ferrin claims, all in anticipation of a certain time when He would give to a pair of said beasts souls suited to their brain-capacity! Such a deliberate proceeding on the part of God through numberless ages would have been but a series of millions of absolute miracle any one of them equal to the creation of a perfect man outright, since each infinitesimal change in the beast's structure toward that end, thus constantly supervised so as to insure final success, would have required unbroken miraculous foresight and intervention.

Besides all this, such a brain developed in a mere beast, according to evolution or the laws of natural selection, would have been a useless incumbrance till the animal carrying it had received an intellect adapted to fill it, and a soul capable of wielding it. Darwin says that an organ unnecessarily large "will be inevitably aborted to the useful size by natural selection." Will Prof. Ferrin tell us how this soulless anthropoid beast of the human form kept his brain of quadruple size unaborted to the proportions for a brute by this law of natural selection until a pair of his lucky descendants were selected to be endowed with miraculous souls? The truth is, it would seem to be no more of a mystery to a logical reasoner how an evolved man-ape, with suitable sized brain, should also evolve within that brain a soul or spirit to match it, than how natural selection could give wings to a wingless species, with an entirely new instinct for using them, without any miraculous interference, all of which theistic evolutionists are obliged to maintain.

But the worst phase of this theistic doctrine is yet to be presented. If man's body was completely developed by evolution before God took him in hand, to give him his soul and spiritual faculties, then we naturally inquire how did this human beast with its naked and delicate body survive its tender infancy without any natural covering of hair to protect it from the weather? We know how such tender young are enabled to survive after the mother has been endowed with a human soul, and intellectual faculties, thus enabling her to provide clothing for the infant in place of the natural hair of the beast. But it is Professor Ferrin's business to tell us how the mothers of

these young beasts, with human bodies but without human faculties, took care of their young without clothing,—helpless human infants to all intents and purposes so far as their bodies were concerned. And further, let him tell us, while he is about it, how such beasts in human form were developed by "*natural selection* and survival of the fittest," more and more naked, helpless and liable to die in infancy, on account of the mere circumstance of gradually becoming upright and acquiring a brain largely disproportionate to their intellects, all by a law intended to make them more capable of surviving? There is no other way of escape from this difficulty for theistic evolutionists but to say frankly that man—body, soul and spirit—was a special creation by the Almighty as taught in Genesis, which at once accounts for the naked and helpless condition of the infant, since the parent is furnished with the requisite intellectual capacity, by the same act of creation which conditioned its body, to provide for it clothing. But if they adopt this view, as some of them have done, then the whole bottom drops out of the evolution theory, for it is manifest if God had to work a special miracle for the creation of the first pair of one single species with a back-bone, phalanges, etc., so nearly resembling those of lower animals, it takes from the theory its strongest argument and proves these slight vertebral variations to be the result of miraculous intervention instead of natural selection which evolutionists have always claimed to be the only possible solution of the problem. There is not a man living who is capable of reasoning philosophically who would not say that if a single species of fully developed animals, with an anatomy like that of lower animals, came into being by direct miraculous creation, then every vertebrate species must have originated in like manner; otherwise God's ways in Nature are neither uniform nor consistent. Haeckel, the most learned and consistent of all modern naturalists, has repeatedly said, substantially, that one demonstrable act of miraculous creation on the part of God must necessarily break down the evolution theory, whatever the appearances that may be shown to be in its favor. Hence, it is either evolution from the ground up, that is, from inanimate dirt by spontaneous generation up to man, body, soul and spirit, or it is miraculous interposition on the part of God for the beginning of each specific tribe. There is no compromise possible here with the evolution theory, either atheistic or theistic. Evolution, however, has its proper office to fill, and its legitimate work to do in the gradual improvement or development of a species within its specific limits. Thus

man has been evolved, if you please, from the lowest tribe of savage barbarians up to the highest Anglo-Saxon civilization, just as he possibly once degenerated by retrogression or want of this evolution from a perfect man, as he left the hand of his Creator down to the lowest depths of barbarism. But all this while, and during all this transition, he was still *man* and nothing else. No amount of retrogression could ever transmute him into an ape or into anything lower than a degraded human being, and no amount of evolutionary cultivation or refinement could ever raise him above the specific nature of humanity, or other human beings except in his physical, moral, and intellectual character.

In like manner the present dog-species may have been evolved from wild Arabian canine animals up through all the diversified known varieties to the present beautiful Persian greyhound; but through all this evolution the specific limits have not been overreached. They are dogs all the while; and if development could be carried on to eternity, with man's intellectual genius to aid natural selection, the dog could never transcend his species or be transmuted into a bear, a leopard, a wildcat, a kangaroo, or anything but a dog. God only is capable of producing transmutation; and as it would be just as easy for Him to form a new species by a direct miraculous act of creation, hence that has manifestly been His order in Nature for the origin of all species.

Much confusion and misapprehension exist in the minds of the masses over this very distinction, many supposing, because the fancier can by intelligent selection and great judgment produce wonderful changes in the form, color, and general appearance of common dove-cote pigeons, for instance, that therefore "natural selection unaided" by intelligence ought to do still more, and change pigeons into prairie chickens, hawks into robins, or crows into parrots. The truth is, this is all pure assumption without one redeeming spark of reason in either its warp or its woof. A hawk, for example, by natural selection, might come to fly swifter if its prey were by the same law improved in the speed of its flight; or the hawk, on the contrary, might deteriorate in the velocity of its movements through the air should its prey for a long period of time prove to be more and more sluggish and, therefore, more easily caught. But it, most surely, could never cease to be a hawk. Plainly, it would be far more consistent and easy for Nature to keep the bird what it is than to transmute it into something else entirely different in form, struc-

ture, and instinct, changing both its nature and mode of subsistence.

We treated this phase of the discussion quite exhaustively when writing the *Problem of Human Life*, and have not seen cause to change in opinion an iota since, except to become firmer in our faith that it is vastly more difficult to believe in the transmutation of species by natural selection than to believe in direct miraculous creations; for the reason that the one supposes a most complex intelligent result, involving numerous ingenious designs, brought about by a mindless, will-less, and designless force of Nature, while the other supposes it to be an achievement of infinite intelligence. Possibly we cannot close this article better than to quote a brief extract from the "*Problem*," at page 490, that those of our readers who have not seen the book may be able to judge of its original treatment of this question:

"I will not write a long article on the achievements of the breeder and the fancier, the importance of which has been so often and so much exaggerated in support of evolution. No man knows better than Mr. Darwin that the pigeon-fancier could not make the least improvement in the form or color of a dove-cote pigeon except by first noticing some slight chance variation from the normal color or form, which might happen to occur, and then separating and breeding from that individual and its descendants having the same peculiarity, and thus exaggerating that peculiar character, whatever it might be, from generation to generation, by constantly separating and breeding from such individuals as possessed it in the most marked degree.

"Should a fancier act on the principle and plan of Nature, according to Mr. Darwin's law of natural selection, and preserve only the hardiest, strongest, or ablest-bodied pigeons, paying no attention to any casual peculiar form of beak, head, crop, or tail, leaving all the species to cross and freely intermingle, with the bare exception of following natural selection and weeding out the weak and puny individuals just as survival of the fittest is supposed to do, he would never succeed in producing the slightest difference in the present form and appearance of the pigeon, if he and his successors should follow this course for a million generations! Mr. Darwin and Professor Huxley both know this statement to be literally true. Can any one be so devoid of reason or so blinded by the theory of evolution as to suppose that a succession of even a million fanciers, working twenty-five years apiece, commencing with our common dove-cote pigeons and treating them exactly as Nature treats her species, in preserving only the fittest, the strongest, and the ablest-bodied, subjecting them at the same time to every conceivable variety of conditions, could produce a tumbler, carrier, pouter, or fantail, or the slightest change in form or color? If not, is it not the clearest demonstration that Nature, acting on the same plan precisely, could never have transmuted the wild-rock pigeon into our common

dovecote? Yet evolution teaches that natural selection—with no intelligence, prevision, choice, or judgment, without the power of separation, and with no means of preventing free intercrossing, can not only do what a million intelligent men working in succession could not do, but is entirely competent to transmute a pigeon into a hawk, a robbin into a goose, or a sparrow into an eagle!

"Mr. Darwin admits that under Nature the dovecote pigeon has not undergone the least change for thousands of years, existing as it has in all varieties of climate from the far north and south to the equator. He says:—

"Dovecote pigeons have remained unaltered from time immemorial."—*Animals and Plants*, vol. I., p. 270.

"Now, if dovecote pigeons, living under the greatest diversity of conditions and climate, feeding upon all varieties of food, possessing an organization more susceptible of variation or liable to undergo change than any known animal, shall still remain "unaltered from time immemorial," pray how long would it probably take to change a blue-rock pigeon into a dovecote, with no more diversified conditions or environments, to say nothing about the transmutation of the thousands of species, genera, families, and orders of birds, ranging from the smallest of the trochilidae up to the ostrich, from some kind of a reptile? The mere propounding of such a question, in connection with the fact just quoted from Mr. Darwin, is sufficient to show the practical impossibility of transmutation under natural selection. If no change has been produced in the dovecote pigeon for five thousand years, under the most favorable situations and conditions for divergence, it is but fair to assert that under natural selection no change has ever been produced since this species was originally created. If Mr. Darwin admits, as he does, that a species with the most sensitively varying organism can thus have existed under the greatest variety of conditions and environments for five thousand years, or "from time immemorial," without the least change, it completely overthrows the hypothesis of specific transmutation, until such time as positive proof shall be adduced going to show beyond a peradventure where some one species has been transmuted into another, by natural selection and survival of the fittest.

"Another fact, before leaving this point, must not be overlooked in this estimate of the dovecote pigeon. Tens of thousands of fancy and peculiar artificially-bred pigeons have been constantly escaping, from time to time, from the aviaries of the rich and noble of all lands and throughout all historic ages, mingling with the normal dovecotes, as every man will admit who is conversant with the subject,—and thus adding the impetus of their already partially divergent structures to any tendency which might exist among dovecotes toward forming a new breed, thus proving that no such a tendency exists in Nature or ever has existed! It rather demonstrates that the tendency is exactly the opposite, namely, permanence of specific limit, since not the slightest remnant of such artificial forms can be traced among present pigeons.

"There is not the least doubt, from the facts here hinted at, if a thousand of the most perfectly bred carriers and a thousand pure fan-

tails were let loose in a village where there was an equal number of dovecotes, that not a vestige of the tail of the one or the beak of the other would be visible in their descendants, even in ten years after they were free to intermingle. Thus, the direct tendency of every abnormal form in a species is to revert to the normal type, which is the exact opposite of evolution, and a flat contradiction of the possibility of transmutation."

TRANSMISSION OF PULSES.

One of the most important questions in physical science is that relating to the true laws and principles governing the transmission of condensed pulses through elastic bodies. That a pulse, or so-called wave of condensation and rarefaction, will be communicated through even as tenuous a medium as air from particle to particle at considerable velocity and to a considerable distance, by the sharp blow of a body passing through it, we never doubted. But that a mild blow or slow motion of a body will cause a pulse to travel through the air with the same velocity (if at all) that a swift blow will, is what we not only doubt, but decidedly controvert. We have repeatedly denied the truth of this assumed principle of physics, as laid down in the text-books, and have called upon professors of colleges for the proof. The truth or falsity of the wave-theory of sound absolutely hinges, as all scientists are forced to admit, upon the correctness of this teaching; for plainly, if the wave-theory be true, that sound consists alone of such air-pulses or atmospheric condensations and rarefactions, it must then be true that air-waves sent off by a tuning-fork when its prongs are moving only at the rate of one inch in a second at their swiftest velocity must travel precisely as fast as when the prongs are moving with forty times that velocity. There is no dispute, nor can there be, about this teaching of the theory, since the very weakest sound that can be measured, produced by any instrument, is universally conceded to travel with the same velocity as the sound generated by the swifter motion of the prong or spring. Now it is either true that all air-pulses, whether produced by a swiftly or slowly moving body, travel with the same velocity, or else the wave-theory of sound is false, and all professors of physics in our colleges are teaching error instead of truth.

In our remarks following Prof. Goodenow's paper in the October number of *THE MICROCOSM* we referred to and quoted Prof. Mayer's teaching on this subject in the article on *Sound* in *Appleton's Encyclopedia*, in which he tells us, in strict accordance with the theory, that condensed pulses whether strong or weak will be propagated through a tube at the same uniform velocity and at the exact velocity of sound. We have positively denied this claimed law and, as we think, have shown it to be absurd on its face in the *Problem of Human Life* at pp. 166, 167 and onward. We have challenged professors of physics to the test of an experiment with a pipe of sufficient length to settle the matter and arrive at the exact truth. A quantity of common gas-pipe could be readily borrowed for the purpose from any dealer, to reach, say, half a mile, then curve by a half-

circle, and return. A piston could be easily fitted into one end of this pipe so that it could be instantly driven in by the blow of a hammer to any desired distance determined by a gauge, and at varying velocities, and thus absolutely settle the question which Prof. Mayer has so authoritatively guessed at in the Encyclopedia. If a quarter-inch instantaneous movement of the piston, with a corresponding condensation of the air in the tube, would send the pulse through the pipe one mile in exactly the same time as would an instantaneous movement of the piston six inches, and both of these at the exact velocity of sound; and if a slow movement would give the same result as a fast one, it would furnish a test in favor of the wave-theory that would be worth all the guesses in all the encyclopedias and natural philosophies in the world. We simply predict that the main result would be the total explosion of the wave-theory of sound. We would cheerfully take part in a series of such experiments, and would willingly make it the ordeal for settling the truth or falsity of the wave-theory, if some progressive college would undertake them and bear the trifling expense. Why could not Professor Mayer, of Stevens Institute, directly across the river at Hoboken, be persuaded to undertake this beautiful scientific test, and thus demonstrate the truth of his teaching in the ablest article he ever wrote—that in the Appleton Encyclopedia, on *Sound*? If he will do so we will promise him to report the exact facts in THE MICROCOSM, whether they shall be for or against our own positions. But we have no hesitation in predicting as we have done so often, that whenever such experiment shall be fairly tried it will be found that the pulse generated by an instantaneous travel of the piston six inches will pass through the tube coming out at the other end some seconds quicker than the pulse generated by an instantaneous quarter-inch travel of the piston.

We further predict, if the piston be pushed into the tube one inch during one second that the pulse (if we may call it a *pulse*) will be much longer in making its exit at the other end than if the piston be pushed into the tube twelve inches during the same time. Yet it is well known that the *sound* of the tuning-fork would go through this mile of pipe in exactly the same time, whether its prongs were moving at the rate of one inch in a second at their swiftest travel, or twelve inches, or forty inches! Prof. Mayer, in the great Encyclopedia article referred to, admits that there would be no difference in the velocity of sound in passing through the tube, whether it were strong or weak,—whether it were caused by a slow or a fast motion of the vibrating prong;—but he also positively claims that the condensed air-wave produced by the piston under the same conditions which we have named would give the same result as in the case of sound, since in every case the air-pulse would travel at the same velocity as the sound-pulse, or 1120 feet in a second, at 60° F. Of course a believer in the wave-theory is forced thus to teach or totally abandon the present system of acoustics. If the weak air-pulse should be much longer in going through the pipe than the strong one, it is plain that sound cannot consist of air-pulses at all, because all sounds, whether strong or

weak, high or low, travel at the same uniform velocity in the same medium. This was demonstrated, by M. Biot in having airs played (composed, of course, of a great variety of sounds) at one end of a long line of gas mains in Paris, —2,800 feet long, if we remember aright,—the result of which was, that perfect harmony, even with several instruments together, was maintained at the far end of the tube. Plainly if the loud sounds, caused by greater condensation of air according to the current-theory, travelled swifter than faint sounds all music would have been destroyed. Hence the truth of the wave-theory absolutely depends on the result of the test we have proposed.

It is simply amusing to reflect upon the manner in which this error, as we claim that it is, has come to be so firmly established in our text-books. Sound-velocity, the only factor in the premises that has been determined by actual observation, has been proved by many experiments to be about 1120 feet in a second. Then assuming or taking for granted that sound is nothing but a series of condensed pulses of air, Professor Mayer and all authorities on sound have easily guessed that any condensed pulse of air, however produced, must travel at precisely the same velocity as sound itself, no matter whether it should be caused by the stridulation of a katydid or by a magazine explosion. And so natural has been the train of reasoning, or absence of reasoning, that has caused this superficial transition from fact to mere fancy, physicists, without knowing it, have actually combined, with the simple air-pulse caused by a mechanical shock, the enormous expansive shock of a body of generated powder-gas at a magazine explosion, and have called it all *sound* or *noise* because forsooth a great sound or noise naturally occurs at the same time! Surely men who cannot distinguish in their philosophical reasonings between the devastating effects of such a tremendous gas-wave and the absolutely harmless sound which accompanies it, should scarcely be expected to do otherwise than carry out the full import of the wave-theory in their teachings. Hence the grave absurdity, as learnedly laid down by Prof. Mayer in his Encyclopedia article just noted.

But how did an error so manifestly superficial, first get possession of the minds of physicists and so completely that they have not since been able to shake themselves loose from it? We answer, it originated in the strange mathematical calculation of Sir Isaac Newton in his effort to formulate the necessary and scientific velocity of sound from the elasticity and density of the air. And such a formularization! No wonder that the great mathematicians and astronomers, D'Alembert and Bernoulli, declared their "utter inability to comprehend such *intricate and disjointed demonstrations*" as those of Newton in relation to the sound problem. But we cannot probably do a better service to our readers, nor better serve the cause of true science, than to make a verbatim extract from the *Principia* giving this *singular* so-called demonstration. The reader will, of course, be prepared in advance for something unquestionably scientific as well as very profound, since it is from the *Principia*:

"And since a pendulum thirty-nine and one-fifth inches in length completes one oscillation,

composed of its going and return, in two seconds of time, as is commonly known, it follows that a pendulum 29,725 feet, or 356,700 inches in length will perform a like oscillation in 190½ seconds. Therefore in that time a sound will go right onwards 186,768 feet, and therefore in one second 979 feet. But in this computation we have made no allowance for the crassitude of the *solid particles of the air*, by which the sound is propagated instantaneously. Because the weight of air is to the weight of water as one to 870, and because salts are almost twice as dense as water, if the particles of air are supposed to be of near the same density as those of water or salt, and the rarity of the air arises from the intervals of the particles, the diameter of one particle of air will be to the interval between the centres of the particles, as one to about nine or ten, and to the interval between the particles themselves as one to eight or nine. Therefore, to 979 feet, which, according to the above calculation, a sound will advance forward in one second of time, we may add $\frac{2 \frac{1}{2}}{9}$, or about 109 feet, to compensate for the crassitude of the particles of the air: and then a sound will go forward about 1008 feet in one second of time." (Book II, Prop. L.)

Here we have the renowned formula by which physicists have been so confused, but which is in keeping with much that goes to make up the incongruity of the wave-theory from its alpha to its omega. In the first place, what necessary or practical relation the complete oscillation of a pendulum 39½ inches long in two seconds by the action of gravity alone, can sustain to the movement of a condensed air-pulse which is claimed to be conveyed by the elasticity of the air alone, is one of those things that could well confound a mathematician of D'Alembert's capacity. But the strange, not to say amusing, part of Newton's calculation is, that after he had formulated the speed of an air-wave by its relation to the motion of a pendulum, the calculated pulse actually lacked nearly 200 feet to the second of going fast enough to correspond with the observed velocity of sound! Then the funniest thing of all is the manner in which he tries to account for this astonishing discrepancy. Reader, listen: He supposes the air to be composed of "*solid particles*," and that the fluidity of the air consists in the fact that these "*solid*" granules do not touch each other, but that they are about nine times their own diameter apart! Then he assumes that the condensed pulse goes instantaneously through this *one-ninth* of solid granules, consuming its whole time of travel in passing through the eighth-ninths of vacant space between them, thus adding one-ninth to the distance sound would otherwise travel in a second. Hence, Newton's great sound-formula, upon which the wave-theory is now taught, was originally constructed upon the supposition that sound must travel instantaneously through all solids, not being aware of the fact that it consumes a second of time in passing through solid iron 19,040 feet, as now well known by observation, and that sound consumes considerable time in passing through the solidest substances known.

But the culmination of the fallacy of this whole formula is reached when Newton is forced to conclude that after the "*crassitude*" or thickness of the "*solid particles of the air*" is

allowed for, the pulse travels through the remaining eight-ninths of the distance *without any conducting medium whatever*, or through a perfect vacuum which, as now well known, prevents the progress of sound entirely! Of course the space between the air-particles must be free from air. This is the worst fix we have ever known a great philosopher to demonstrate himself into. But does the apologist for Newton say, that the one-ninth may be "*solid particles of air*," while the remaining eight-ninths of the distance may be *fluid particles of air*? Then how did Newton know that there were any "*solid particles of air*" in the premises, or that the air was not all *fluid particles*? Surely if eight-ninths of the whole atmosphere can be fluid and without "*solid particles*," what right had Newton to assume without a semblance of proof that there are any "*solid particles*" at all, merely to relieve his formula from its absurdity of falling short of the observed velocity of sound, as it does by about 200 feet? If eight-ninths of the air can manage to get along without "*solid particles*," we fail to see what use the other ninth has for such solid material, unless it be a special provision to aid the wave-theory.

If the spaces between these assumed "*solid particles*" are really vacant, then of course, as just observed, the sound cannot travel at all, as it must have a conducting medium; but if they are filled with air or any other substance, then what right had Newton to assume that such filling-in substance did not also possess one-ninth of "*solid particles*," which would convey the sound through their "*crassitude*" instantaneously? And why did he not then claim that the remaining spaces between these last "*solid particles*" were also filled with other substance containing other "*solid particles*," and so on, *ad infinitum*; thus finally getting "*solid particles*" touching each other through the whole distance, and without any time at all being required for the passage of sound? *Reductio ad absurdum*! Positively the most stupendous piece of childish nonsense on record in any scientific work, is this same so-called "*demonstration*" of Newton, in which he absolutely shattered the wave-theory of sound by nearly 200 feet in a second, and then tried to mend it by supposing the air constituted of "*solid particles*" with nine times their diameter of vacant space between them. We have called it, in our derisive haste, "*the most stupendous piece of childish nonsense on record*." We take it back. Laplace, seeing the utter folly of Newton's explanation, and seeing also that, without some way of accounting for this discrepancy between the calculated and observed velocity of sound in air, the wave-theory had hopelessly broken down, and as a protection to Newton's main formula, invented the solution now taught in all colleges, namely, that the *heat* generated in the condensed portion of an air-wave and the *cold* generated in the rarified portion so increased the elastic action of the air as to help forward the sound-waves enough faster to make up this deficit of nearly 200 feet in a second! That is to say, an insect of the genus *locustidae*, in filling four cubic miles of air with the sound of its stridulations, actually heats and cools the entire mass by mechanical compression and expansion 440 times a second, and to such a de-

gree as to add nearly 200 feet in a second to the velocity of its own sound! This unquestionably throws Newton's solution entirely into the shade and, without a doubt, ought to carry off the first premium for bald absurdity, even over the "solid particles of the air" with nine times their diameter of empty space between them. And why physicists have preferred Laplace's to Newton's solution rather than to laugh at both and give up the wave-theory as a self-convicted fallacy, is another of the things about which the unscientific reader desires information. But we cannot prosecute this inquiry further at present. We will only add, without mental reservation, that any theory of science which depends for its existence upon such frivolous and foundationless theorizing, is hopelessly doomed, and must in the near future give place to rational suppositions and demonstrated facts.

THE COLD AND HEAT PROBLEM.

We print in this number the closing portion of Dr. Roberts' great paper on Cold and Heat. We request every reader carefully to study it in connection with the first part in last month's *Microcosm*, forming as they do together a very able scientific treatise. Our offer of \$10 and a life-subscription to *THE MICROCOSM* to the one who should first send us a positive and simple demonstration, one way or the other, has called out some considerable correspondence, and two or three supposed demonstrations, but up to going to press nothing conclusive for or against the Doctor's position has been suggested. This, we will show next month. In the mean time we have not been idle ourself in cudgeling our brains for some experiment that should determine the matter for or against Dr. Roberts, and thus settle the controversy if possible. We are happy to announce our good fortune in hitting upon just such an experiment which we have tried to perfect satisfaction. This experiment is so simple that any child can try it; and its result is so conclusive, and clear to the ordinary mind that it ends all controversy on the subject. We will not here state which side of the question comes off victorious. We reserve that sensation for next month, when the experiment will be fully described, and its unavoidable result given. In the mean time let our investigating readers think on, as our successful solution of the problem does not prevent some lucky student of science winning the prize, if ours or any other equally simple and conclusive demonstration shall be hit upon and mailed to us by the 15th of the present month. Of course we shall not be a competitor for the prize, as against an outsider; but will give our own demonstration in connection with any other conclusive experiment that may be sent to us in time.

DR. WILLISTON'S BOOK.

We have received a copy of the long promised Book of our esteemed contributor, the Rev. T. Williston, M. A. It is a beauty in the style of its make-up, and still more attractive in the nature of its contents. Its Title is—"Orthodox Paths Retraced, or The Old Theology." It contains 341 pages, and will be sent by mail postpaid for \$1.25. It can be had at this office, as well as of the author at Ashland, N. Y.

We have read here and there articles in it,

and find them fully up to the standard of the author's contributions which have appeared so acceptably in *THE MICROCOSM*. No one can fail to be the better and wiser by reading this valuable volume.

Owing to the pressure upon Dr. Williston's time and attention, in getting his book through press he begged us to defer his forthcoming communication on *Foreknowledge, Nescience*, etc., till next month, which we have done.

A VALUABLE INVENTION.

Joseph Goodrich, of 422 West Fifteenth street, invited us to witness the operation of a new foot-power attachment to the common bench-vise, used by all blacksmiths, machinists, etc. It is, without doubt, the most powerful pinching machine of its size ever constructed, and as novel as it is effective. As an illustration of its power, an ordinary solid iron grape-shot, three-quarters of an inch in diameter, held between the jaws of the common vise, can be crushed to fragments by simply placing the foot upon a pedal near the floor. This improvement must be of great value to metal workers for many purposes in almost any shop where a vise is used; since, for three or four dollars the attachment can be added to any ordinary vise now in use. Mr. Goodrich has secured patents here and in Canada, and a company, as we learn, is about covering the invention with many foreign patents. Success to the fortunate inventor.

PROF. COMSTOCK ON THE LOCUST.

Next month the readers of *THE MICROCOSM* may expect a treat from Prof. Comstock, of Knox College, at Galesburg, Ill. He has ventured at last to come out plainly in an article for this magazine and express himself, as clearly as one might expect, on the locust problem, in which he tries to reconcile the facts in that case with the current theory of acoustics. Of course we shall reply to him, and we propose to make the chair of physical science in Knox College too warm for any undulationist to sit in for the next twelve months, metaphorically speaking, of course. We only trust that the professor will not, as he did once before, send peremptory orders for his article to be suppressed.

DR. VAN DYKE'S GREAT BOOK.

Last month we noticed Dr. Van Dyke's book—"Through the Prison to the Throne"—and spoke of it only in the terms of just praise, which we believe it merits. We did this without thinking that we should ever be interested pecuniarily in its sale. Since that issue of *THE MICROCOSM* we have made arrangements with the author to become financially interested in the sale of this truly grand production, as it turns out to be after carefully reading it through ourself. We candidly believe that no person who buys a copy of this work will ever regret the dollar he pays for it. We now have a supply of the books at our office, and will send a copy, postpaid, on the receipt of the price—\$1. We will also send a copy as a premium for three subscribers to third volume of *THE MICROCOSM* (\$3), or to any one who will buy a copy of the "*Problem*" (\$2), or a copy of first and second volumes of *THE MICROCOSM*,

bound together (\$2.50). Here is an opportunity to secure a book of no ordinary value by a very little effort.

PREMIUMS FOR SUBSCRIPTIONS.

In all our offers of premiums for subscriptions, agents and those who get up clubs will bear in mind that we cannot keep a running account, as such book-keeping would cost about as much as the premiums offered, when all names for a given premium are sent in at one time. Persons desiring premiums will therefore retain subscriptions till they have enough to pay for one according to our published terms, and then send all *at once*. This ends the matter, and saves us a deal of trouble. Remember, also, that all subscriptions must begin with the volume or the half-volume,—August, No. 1. or February, No. 7. We feel sure it is every subscriber's interest to begin with the first number of the volume, and then preserve it for binding and reference.

CHRISTMAS AND NEW-YEAR'S PRESENTS.

We forgot to intimate in the December number that no better or more appropriate present for the holidays could be sent to a friend than the *Problem of Human Life*; first and second volumes of *THE MICROCOSM*, bound together; third volume, monthly; *Universalism against Itself*; *Walks and Words*; *Retribution*; etc. Several have supplied our neglect by sending such orders. It is not too late yet. These books, or any one of them, would, as a rule, be valued more highly than any ordinary present, such as is usually selected. Who, that has a distant friend, will act on this suggestion?

SCIENCE WITHOUT INFIDELITY.

We are receiving many letters from our subscribers congratulating us and the reading public upon the fact that there is at least *one scientific journal* unsaturated with evolution, materialism, infidelity, etc. It is a fact, patent before all men, that out of the score of distinctively scientific publications in this country and Great Britain, *THE MICROCOSM* is the only one that does not either advocate or lean strongly toward the infidel theory of evolution. Shall this single *oasis* in the scientific desert be made to flourish and bloom by the aid of believers in God and true science? What say our thousands of Christian subscribers?

ARTICLES CROWDED OVER.

We are still unable to put into *THE MICROCOSM* all the articles we desire to print. Several are crowded over this month. One in type, from the pen of Prof. Lowber on "Substantalism and the Bible," is especially interesting and instructive. Substantalism is growing in favor every month and making hosts of new friends and converts. Our own convictions become more and more confirmed in favor of its necessity as a satisfactory solution of the problems forced upon the church by the more recent claims of materialistic philosophy. Indeed, at every new survey we take of the philosophical situation, the practical difficulties in the way of the permanent establishment of the new departures we have made in science become less

and less formidable. With the aid of our excellent army of subscribers, led by our invincible contributors, we hope for clear sky, and a bright future by the time the present volume closes.

A SINGLE HINT.

Dr. Andrew Clark, Her Majesty's physician, read before the British Association recently a paper in which he said:

"There is no law of physics, not *even the law of gravitation*, without great growing exceptions, and no theory of physical phenomena, not *even the undulatory theory of light*, which is not now becoming more and more inadequate to explain the facts discovered within the area of comprehension," etc.

Dr. Clark has not yet heard the news of the utter overthrow of the wave-theory of sound. But he will hear it; as we have sent him a marked copy of the December *Microcosm*, containing Capt. Carter's report. In his next paper, before the British Association, he can add the wave-theory of sound to the undulatory theory of light, and also name Substantalism if he likes.

LIFE-SUBSCRIPTIONS TO THE MICROCOSM.

A ROUSING NEW-YEAR'S OFFER.

We have an important proposition to make to our subscribers—important to them, but more important to the world. It is this: Any person who will purchase, for cash, *fifteen dollars' worth* of our books at one time, at our wholesale price, will be credited with a paid-up life-subscription to *THE MICROCOSM*. These books being furnished at nearly cost, as our new circular will show, can easily be disposed of at a good profit, thus benefiting all round. There is, perhaps, not a single clergyman, of the thousands who take this Magazine, who could not readily dispose of that quantity of our books by making it known to their congregations. Who, that appreciates the work we are doing, will thus aid the cause of true knowledge? In this way a life-interest in *THE MICROCOSM* will cost the subscriber absolutely nothing. Should we sell an interest in the Magazine, as we contemplate doing, in order to devote more of our own time to editorial work, we will conscientiously see that the rights of all life-subscribers under this proposition are faithfully provided for. Send for circular; then send \$15 for a selection of books, and become a life-subscriber. A list of all such names will be printed in the last number of this volume, and will thus go down to posterity among the fast and original friends of the cause of *Substantalism*.

WILFORD'S MICROCOSM.

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(One Dollar a Year.
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THE SUBSTANTIAL PHILOSOPHY AND THE BIBLE.—NO. I.

BY J. W. LOWBER, M. A., Ph. D.

We have always believed that a true philosophy is in perfect harmony with the Bible. It is a relic of heathenism to maintain that a thing can be theologically true and philosophically false. A pure philosophy can in no sense conflict with a pure religion. The various theories of the past have been so much opposed to religion, that religious people are inclined to reject every system of philosophy. We have examined somewhat carefully the Substantial Philosophy, and we are thoroughly convinced that it is a handmaid to true religion. We will endeavor in a few articles to make this plain to our readers.

Some insist that Substantialism as advocated in *THE MICROCOSM*, is a revival of the old Newtonian theory of light. This is a mistake, for there is but little similarity between the theory of Newton and the Substantial Philosophy. Newton was inconsistent, for he always advocated the wave-theory of sound. In the seventeenth century so much had been learned about the behavior of light, that philosophers began to inquire about the nature of light itself. The question, what is light? is not as easily answered as some might suppose. Although it is by the means of light that we see everything, light is itself invisible. The sunbeam which you think you see shining through a crack in the window-shutter, is only particles of dust so acted on by light that they shine, and thus become visible. We look to the shining moon which is only reflected light from the Sun. Although the light must exist at the place where we see the moon, it is invisible, unless reflected by the little satellite. Newton believed light to be invisible particles of matter.

These particles, he believed, were emitted from light-giving bodies. He tried to calculate how small these particles could be, and not injure the eye. His mistake was in making the substantial pulses of light material particles.

Christian Huygens, a Dutch astronomer, suggested the wave-theory of light; and Newton who believed in the same theory of sound, could not well reject it. Its materialistic tendency is fully as apparent as the old corpuscular-theory of Newton. As Huygens insisted that light is a vibration, it is evident that there must be something between us and the sun to vibrate. To meet this difficulty, he had to suppose space filled with a jelly-like substance called luminiferous ether. He had to suppose this substance sufficiently fine to pass between the atoms of even solid bodies, and that the sun and other luminous bodies caused it to vibrate so that its undulations strike upon our eyes, and give rise to the sensation of light. This theory has entirely too many suppositions, and it fails to account for the phenomena of light. This jelly-like material substance striking upon

the eyes, would be as likely to put them out as would the material particles in Newton's emission theory.

Dr. Hall, Editor of *THE MICROCOSM*, and the original advocate, as well as founder of the Substantial Philosophy, has been called a follower of Leibnitz. He has evidently read the Leibnitzian philosophy, and possibly was much benefited by it; but Dr. Hall cannot strictly be called the follower of any man. Whatever may be the similarity between some of his premises and those of the great German philosopher, their conclusions are very different. Leibnitz has left his impression upon almost every science, and every scientific student is in some sense a disciple of Leibnitz. Leibnitz was the founder of German philosophy, and the most universal genius in modern times. He has been accused of pantheism, but the fundamental principle of his philosophy is in opposition to the theory of Spinoza. Spinoza had looked upon substance as simply pure being, but Leibnitz viewed it as living activity and active energy. This active energy according to Leibnitz, forms the very essence of substance, and it is the central principle of the Leibnitzian philosophy. The monad is a kind of microcosm, and a living image of the universe. The sum of all the monads constitutes the universe.

It is thought by some that Leibnitz substituted the harmony of the universe for God Himself. But this is a mistake, for Leibnitz considered God as a sufficient cause of all the monads. He united the sufficient and the final cause, identified God and the absolutely final cause. With him, the Deity is a primitive substance possessing individual unity. God is pure, immaterial actuality, and the ultimate monad of the universe.

In reference to the origin of things, Leibnitz anticipated the Darwinian hypothesis. In this particular, however, he differs from Darwin. Mr. Darwin maintains that the germs of each separate part were not formed at the beginning, but were continually produced at all ages during each generation, with some handed down from preceding generations; while Leibnitz teaches that the inherent energies and propensities of each monad were formed in it by its Creator when the universe was made.

The Substantial Philosophy of the nineteenth century claims, as a fraction of its teaching, that before matter existed God, as an infinite *Spirit* and Personality, and without a competitor in universal space, was clothed upon by the then immaterial elements and forces of Nature as His exterior being or *body*, so to speak, and that instead of making worlds of *nothing*, as generally taught, He framed "the things that are seen" out of *those things that do not appear*, thus agreeing with the apostle that "of Him are all things;" leaving God, as the direct Creator of the universe, the original fountain of all spirit, life and mentality, and the primordial source of all being material and immaterial. A grand and comprehensive foundation for a new philosophy!

LOUISVILLE, KY.

THE CREATION AND ANTIQUITY OF MAN.

BY PROF. H. S. SCHELL, A. M.

The creation of man, as recorded by Moses, marks an era in the Biblical record, and exhibits, on the part of the Creator, a more exalted purpose than that which describes his previous acts of creation. Those were introduced by such phrases as "And God said;" "And God made;" but now we read, "Let us make man in our own image, after our likeness." Among the forms of organic beings hitherto produced there was none suitable for this intended lord of creation, and accordingly he was made in the image and likeness of God—morally, intellectually, and spiritually—and at once given dominion over all the works of God on earth.

An advance of type-forms seems apparent through the whole process of creation, but no idea of the *development* of the human species from any preceding form or organization is suggested, and none can be entertained, as it has nothing valuable to substantiate it in anything yet discovered. Man was placed *over* Nature and not *in* or *of* Nature, and was given power to rule, and subjugate it to his own uses; and here it may be well to refer more particularly to that ancient heathen hypothesis, now known as Darwinism, the teachings of which are so antagonistic to those of the Bible in regard to the creation of man.

The very first chapter of the Old Testament informs us that man was a *special* creation of God, and made in *His* image and likeness; and the third Chapter of Luke's Gospel declares that Adam was the Son of God. In numerous places in the New Testament, Christians are called "sons of God, heirs with Christ to a heavenly inheritance," and the statement is, that man was created a little lower than the angels; and the Saviour, Himself, instructs His disciples, when they prayed, to address God as their Father in heaven.

When the Jews accused Christ of performing miracles through Beelzebub, the prince of the devils, he regarded the accusation as involving blasphemy against the Holy Ghost, and informed them that such blasphemy would never be forgiven. Now is it not blasphemy against the Holy Ghost to assert that man is an evolution from lower animals, making the Saviour, Himself (on His mother's side at least) the son of an ape, in absolute contradiction of the declarations of **Scripture** which state that He was the image of the invisible God, and which Scripture, we are told, was written by holy men as they were moved or inspired by the *Holy Ghost*?

I throw out this hint for the consideration, especially of theistic evolutionists, many of whom are ministers of the Gospel and sincere friends of that Saviour whom evolutionists by their theory so basely revile.

With regard to the antiquity of man, or how long he has been upon the globe, the data are meagre and uncertain; as chronology is not minutely mapped out in the Bible, and the order of successions given without reference always to the scale of time. Before the time of Abraham the narration in Genesis may be a condensed epitome of foregoing history—not a consecutive line of historical events year by year

and generation by generation—but a condensed epitome of what had occurred in the world from the creation to that time; and this is highly probable, as in some instances the names of individuals are put for tribes, dynasties and nations. There are traditions of a remote origin found among various nations; but a fabulous element can be detected in all of them, and consequently cannot be deemed reliable. The pyramids and other monumental remains found scattered over the surface of the earth date back, at the farthest, not more than twenty-five hundred years B. C.; but if erected as far back as that, they must have been built soon after the flood was upon the earth, according to the received Hebrew Chronology.

The tablet of Sethos I., discovered about thirty years ago in the great temple of Abydos, introduces a new element of complication in these calculations. Upon this tablet this monarch, who is believed to have reigned fourteen centuries before the Christian era began, is represented as offering sacrifice to his royal predecessors, of whom there are seventy-six in an unbroken line up to Menes; and this line coincides with partial lists from other sources, showing that this was the official list of recognized sovereigns in regular succession. And when we arrive at Menes, we find an empire consolidated from previous distinct governments and capable of building the great city of Memphis with its magnificent temples and towers.

If all this be true we must place the flood considerably farther back upon the chronological scroll.

Upon Egyptian monuments that antedate the Christian era about fifteen hundred years, the negro is depicted with color and features as marked and characteristic as he exhibits this day; and the question naturally arises, when did this type originate and how much time before the date when it begins to appear upon the monuments was necessary to establish its marked and unvarying features?

Again, the Egyptians—according to a tablet of Sethos I.—divided mankind into four principal races: The Egyptian—red; the Libyan—white; the Ammonites—yellow; and the negro—black. If all mankind descended from Noah, how much time was required to originate peculiarities of race which can be traced back thirty-five or more centuries?

The remains found in beds of dried up rivers, especially in Belgium, where they have been minutely explored, or in sides of rocks where rivers once had their beds, throw us farther back in the uncertain period of man's origin. Here are implements, evidently fashioned by the hands of men, and along with them the bones of such animals as the cave-bear, hyena, elephant and rhinoceros, now and for centuries extinct on the European Continent.

Similar remains have been found in the valley of the Seine, in France, and scientists claim that there is no room to question the general result of these researches; as the findings are too numerous and well attested, and the geological conditions too well ascertained, not to admit that man existed in Europe contemporaneously with the cave-bear and upon the margin of the glacial age—at least 9,000 years ago.

In the present state of scientific knowledge this whole subject is wrapped in obscurity, as only a small portion of the globe has been examined for relics of antiquity. The vast fields of Central Asia are probably rich in the deposits of the earlier periods of humanity, and these have been but little explored; but from what has already been discovered, there seems to be a call for an extension of time considerably beyond the computed chronology of the Bible in order to admit all that appears to have been effected by man since his first appearance on the earth. Still, scientists are liable to make mistakes, as the readers of the "*Problem*" and of *THE MICROCOSM* must be aware; at all events this phase regarding the antiquity of man is comparatively new, and, as yet, no one is in a position to pronounce upon it with final authority, as the data are not enough for absolute conclusions.

About twenty-five years ago, a great sensation was caused by the announcement that there had been brought up from a depth of over ninety feet under the alluvial deposits of the Nile, a piece of pottery, and profound calculations were made to show how many thousand years old this deposit was—measuring by the rate of formation in the Nile delta;—finally, this was placed at over a million years. A loud cry then arose, "Where's Moses"? But a more careful investigation by archaeologists, proved that the piece of pottery was of *Roman* origin, and the cry subsided; and a silence, equalled only by that now maintained by the great opponents of the "new theory of Sound," set in, and has prevailed ever since. Whatever obscurity, however, is involved regarding the antiquity of man upon the earth, it is a groundless assumption that he began his existence in a low state of barbarism; and there is nothing, thus far, to disprove the representation made in Genesis that man began his existence fitted by his Creator for the work of subjugating Nature, and began at once to do this; and the theory is quite plausible that his mental and material conditions were such as to favor the rapid construction of a civilized society, and that the remains of primitive barbarism found, are tokens of deterioration from the original type of humanity. As for back as the days of Lamech, before the flood, we read of artificers in brass and iron; the invention of musical instruments; the building of cities, &c.; and not many generations after the flood, we read of the building of great cities, such as Memphis with its magnificent temples and towers and huge dykes that turned the course of the Nile. All these facts show that at present we can form no definite conclusions regarding the antiquity of man upon the earth, and must wait for further light; but as far as known we have no *good* reasons for believing that his existence here has been longer than eight or nine thousand years, if as long.

THE LAWS OF MIND.—NO. VII.

BY REV. J. W. ROBERTS.

One who is interested in these papers makes the following inquiries:

"Is it not possible for God to create or bring out of nothing by His own power, the material and living things of the universe? And do not

your arguments seem to deny this power on the part of Jehovah?"

Before answering this compound interrogation it may be well to state that these articles have been written from the material standpoint, on the basis of scientific and philosophical investigation to show that Nature or force, or any other substance, power or principle to be found anywhere outside of a Supreme Intelligent Cause, is utterly inadequate to produce the results that exist everywhere around us, on any hypothesis whatever; and that this inability to accomplish the phenomena of things which exist being *inherent* in matter, and therefore such results impossible to be evolved from or grow out of it, the effort to remove this inadequacy must always and forever result in failure, contradiction and stultification; and this for the oft repeated reason that "*out of nothing nothing can come.*" This proposition has not only been logically demonstrated, but it has been shown that science itself is founded upon this great truth, and all her researches are conducted upon these fundamental principles.

On this line of investigation it has been the aim to show clearly and beyond reasonable controversy, and in the very necessity of things, that there *must* be a great Creative Power—a necessity growing out of the unmistakable insufficiency of any and all other agencies to produce the results known to exist. The reader must judge whether this effort has been successful or not. Other facts and principles will come under review bearing upon these premises as the investigation proceeds.

Now to the inquiry proper. Admitting that there is a God, this involves His omnipotence, and practically means this: Can God create this world and the universe out of nothing? What God can or cannot do, abstractly speaking, is not exactly the point to be discussed. If He is God at all, He must be omnipotent, with all that the term can mean; but possessing this abstract power He still cannot do anything inconsistent with Himself or His own perfections. He cannot lie, or do wrong, or commit sin in any form. Hence the *exercise* of His abstract power is limited by the essential nature and essence of His own being. As it is impossible for a holy God to be impure, so it is equally impossible for Him to contradict Himself in any manner, by act or word; for to do so would be practically to belie Himself, and so blot out His godhead or godship. What follows? Plainly that such a Being never stultifies Himself. He is "the same yesterday, to-day and forever," "without variableness or shadow of turning." Hence, when it is clearly apparent that He has established any fact or principle in Nature, no other fact or principle can be formed in conflict therewith. This is beyond question. God never *improves upon Himself* any more than He contradicts Himself.

Now it is a fundamental law, running through all Nature—a law as already stated, upon which science itself is founded—that *out of nothing something cannot come.* If God is the Author of the universe, then He enacted this all-pervading law. It was His fingers that wrote it upon all the works of His hands. This law, like all others from Him, is but a transcript of His mind, an emanation from Himself, so to speak, a part of His own nature. In this sense, there-

fore, it is God-like. This being true, what must follow? This, certainly, that God has never done anything in antagonism to this expression of His divine pleasure, that no other fact in the universe will in anywise conflict with this one. He must always, and under all circumstances, be consistent with Himself.

But one conclusion seems rational, namely, that God never did anything at any time not in accord with this law, and hence that He did not create the world out of nothing. Those who think otherwise must show cause why God should do any act not in accordance with His own decrees.

The inquirer asks: "Cannot God, by His own power, create a universe?"

Certainly, He can; certainly, He has done so. "Well, what did He create it from? From, by, or out of His power, and not out of nothing. That power is one of the grandest entities of the universe; it is above and beyond everything but the Godhead. But this all-powerful is also an all-present Being. He fills immensity now, and always filled it. It was out of, by or from, this all-powerful, all-present, and eternal *substance*, proceeding from Himself, that the material for the universe was, probably, furnished. "He spake and it was done; He commanded and it stood fast." This view makes God consistent with Himself.

"But does it not make Him a material Being?" Not a whit more than when He "breathed into man's nostrils the breath of life, and man became a living soul," that He also became a human being; nor because a beast derives its life from Him that He becomes a beast. If there is reason or logic in any one of these cases, the analogy must carry them all together in the same direction. Even the frail chemist of earth can transform solid rock into floating vapor, and *vice versa*. And shall not the great and incomprehensible One of eternity do infinitely greater things than these? Can He not, out of His own substance, evolve what He pleases? Who will dare to say nay, or to limit the power of the Highest? Paul understood the matter when he wrote to his brethren at Rome, (Rom. i: xx.) "For the invisible things of Him from the creation of world are clearly seen, being understood by the things that are made, even His power and Godhead." Now, whatever else the apostle here teaches, it is plain that he declares the *invisible things of God are clearly seen by the things that are made*; that is, these visible things bear the unmistakable impress of the *invisible things* which are the "eternal power and Godhead." Yet who would charge Paul with teaching that God is a material being, because from Him proceeds these material things?

From the forgoing, these conclusions appear to be inevitable:

1. To say that God cannot out of His own substance make anything He chooses (for He never could choose to make anything inconsistent with His own nature and perfections) is to limit His power.

2. That His universal law absolutely forbids the bringing of something out of nothing, and yet that He does this, seems clearly to make Him stultify and contradict Himself; and by violating His own law set an example of insubordination to His intelligent creatures.

3. That the impartation of life or being from Himself to any creature, does not make Him the partaker of that creature in kind or in any degree whatever; though the creature may, in a greater or less degree, partake of His nature and bear the impress of His hand.

4. That the analogies of Nature, as well as her laws, indicate that all things visible and invisible, *proceed from God*.

If the inquirer will pause and think a minute he will see that the query he propounds contains in itself the germ or essence of its own answer. "Cannot God *by His power*," etc., is its substance. If God does these things by His power, is it not plain that they *come out of His power*, and not out of *nothing*? How much does this fall short of being self-evident?

"But does not the Bible, which is accepted by so many wise and good men as the word of God, declare that in the beginning the earth was without form and void? And can any substance be without form, or be void? These declarations seem to antagonize some of the positions you have taken. How do you explain them?"

The Hebrew words (*tahoo* and *bahoo*) which are translated "without form and void," do not in any case mean *nothing* but *something in disorder or confusion, or lacking in arrangement*. The word *chaos*, as used by the Greeks, and from them by most civilized modern nations, convey about the same idea, which is, that the substance of created things was there; but did not take tangible or material form until the "Spirit of God moved upon the waters." There are three remarkable expressions here, namely: earth, waters, and darkness, all of which convey the idea of existing substance; but there is not a word used in the narration that indicates *nothing*. Whatever the terms "without form and void" may mean, they are applied to the *earth*, not to an incomprehensible *nothing*. "But God is light, and how can His substance be in darkness?" "The darkness and the light are alike to Him;" and they are both made apparent for the benefit of His creatures. "God is love;" but that grand truth does not prevent hate from existing in the bosom of His creatures.

The whole account evidently shows that God moved upon some substance already existing, and from it "formed the worlds." What that substance was, we are not told; but it is reasonable to conclude, as already stated, that it *proceeded from Himself*. In further support of this view the following argument may be adduced: In all parts of His dominion of which we have any knowledge God has written His disapproval of *vacuums*. So far as our knowledge extends there is not a vacuum in all the universe. God is the same "from everlasting to everlasting." He has, therefore, always disapproved of *vacuums*. If there was a place anywhere where *nothing* existed, certainly that place would be a *vacuum*. But God, Himself, *fills* immensity. There is no spot where He is not. He is, omnipresent. And where *His presence is*, surely there is *something*. It may then be said, with logical assurance, that neither reason nor revelation sanctions the idea that God made the universe out of nothing.

If by the term *nothing* we are to understand that is meant which cannot be detected or com-

prehended by the five senses, which are themselves *material*, and therefore can only take cognizance of material things, there need be no controversy on the subject. God is not known by these senses, neither in His person or substance.

To the other inquiry, "Can any substance be or exist without form," the answer will depend upon what idea is attached to the word form. If by it is understood that kind of form which physical science develops, the answer will be yes. But this idea will be more satisfactorily developed as the laws of mind are unfolded, and for the present is passed without further elaboration.

In the illustration of the building in process of construction, heretofore given, it was shown that the edifice first existed in the mind of the architect—a thoroughly immaterial existence. There it was transferred to paper or canvas, and afterward made to take its material form. The universe, in like manner, first existed in the mind of God, before a word went forth from Him. Then He crystalized His *thoughts* into *worlds*, and arranged these worlds, into systems. This was done by His own energy. So it may be said that out of the *substance of His thoughts came the substance of the universe*. And this was utilized to subserve the divine purpose, as it existed in the mind of God prior to its taking form "by the word of His power," "when the morning stars sang together and the sons of God shouted for joy." This, certainly, is orderly and rational.

"If God makes matter from His own substance, does He not just that far become material?" The answer to the inquiry has been largely anticipated, but a few additional thoughts may be given. If a man builds a house, does he become a house or any part of it? If a father begets a child does he become the child, or any part of it? If a teacher imparts instruction to a pupil, does he become that pupil? If finite beings, in countless ways, can impart to others a *part of themselves* without in any manner *transmuting themselves into those to whom they infuse a measure of their substance*, how much more can the Infinite Jehovah develop from Himself whatsoever He pleaseth without becoming the thing developed, or in any manner affecting His identity, substance or person? Is not a misconception of *words* or *ideas*, rather than a proper conception of *substance*, at the bottom of any difference of opinion on this subject?

From this long digression, seemingly made necessary by the exigencies of the case, the theme proper must be resumed in the next number.

GRAVITATION.—A NEW THEORY.

BY PROF. W. H. H. MUSICK.

The gravital force that is exerted by a body, resides in moving invisible substance, that constantly approaches the body on all sides. This moving substance, by impinging on the ultimate atoms of other bodies, impresses motion on them in the direction of its own movement, viz., directly toward the attracting mass. This moving substance—which I shall designate as *gravital substance*—is definitely related with

definite portions of matter by which its motion is determined.

The motion of gravital substance is perpetual, and its velocity constant, and there is a definite quantitative relation between this substance and gross matter; in other words, mass and gravity are in direct proportion, constant for all kinds of matter throughout Nature.

The foregoing theory is strictly in harmony with the laws of falling bodies, and orbital motion; and is—so far as gravitation is concerned—complete; but the law of conservation requires; that the perpetual concentration of gravital substance in bodies, be correlated by a corresponding out-flow of substance, the radiant movement precisely coinciding—by inversion—with the convergent movement of gravital substance.

I submit the above, as my complete theory of gravitation. If it be accepted, we are then in a position to speculate as to the possible identity of gravital substance with other known principles. I herewith submit certain analogies between the principles of electricity and magnetism, and the *theoretical* action of our *hypothetical* gravital substance; and leave others to theorize on the subject.

First: Electricity or its products permeate all kinds of matter, and pass without impediment through the densest materials for thousands of miles. Second: Philosophers say that the velocity of gravity approximates the infinite; and Electricians say that the velocity of electricity is, practically, infinite. Third: Electricity, magnetism and gravity are the three forces in Nature, that are known to operate on distant masses. Fourth: Electrical force, like that of gravity, follows the law of radiant emanations; that is, its intensity varies inversely as the square of the distance. Fifth: Electricity is the only principle of force, other than that of gravity, whose action has been traced through planetary space—from the sun to the earth. Sixth: The earth is considered to be the great source of magnetism, and reservoir of electricity, so far as our experience is concerned. We know that the earth is the source of terrestrial gravity. Seventh: The intense heat and vivid light of the voltaic arc, is analogous to the incandescence of the sun, that is supposed to be produced by the action of the solar gravity on the matter of the sun. Eighth: The principle of magnetic and electrical polarity, is analogous to the convergent and radiant movements of substance, that I have supposed incident to the action and correlation of gravity.

But to return to our theory of gravitation. It may be said that the radiant movement would neutralize the force of the gravital substance. I answer: That though the movements of substance are equal, we can easily conceive of a constitutional difference that would remove the difficulty. As to the ultimate principle of force that gives motion to the gravital substance, by the hypothesis, it is *in motion*, and the principle of inertia *may* be as potent in such substance, as in gross matter; or, the material atom and its related gravital substance *may* properly constitute one natural unit, combining static and dynamic principles as separate but mutually dependent functions of the entitative whole.

VANDALIA, Mo.

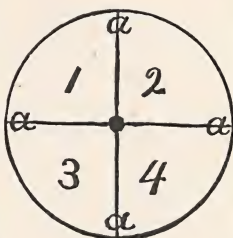
THE CHILADNI PLATES EXPLAINED.

BY CAPT. R. KELSO CARTER, A. M.

Having buried the wave-theory beyond the possibility of a resurrection, by showing the glaring self-contradictions involved in its premises, we will now undertake to explain the phenomena of the Chladni plates to the full satisfaction of every reader.

1. Prof. Tyndall says that when he holds his hand close above one sector of the vibrating plate, the increase of sound is due to the fact that his hand stops the vibrations from that sector and removes its interference with the others. Now the sound does really increase when this is done. But what a preposterous reason. According to this it is only necessary to hold a flat body in front of a bell, or other sounding metal, in order to shut off all the sound. In other words, if you are standing near a church bell which was ringing loudly, and some giant should stretch an enormous hand large enough to cover the whole bell, between it and you, we submit that, by every principle of logic, you would hear nothing. Now could anything be more ridiculously superficial than such reasoning as this, of the "greatest living authority on sound?" But it must be plain even to Messrs. Tyndall and Mayer, that if a man's hand can stop the vibrations from a *part of a plate*, a larger hand must necessarily stop the vibrations from the *whole of it*. Under any possible system of dodging, these gentlemen must be compelled to admit that a suitable object, as a flat board, held near or over a plate so vibrating must at least *diminish* the sound, to a listener standing a few feet away. Will you admit this, gentlemen? Having done so, let the experiment be tried, and strange to say, not only is there no diminution, but an *actual increase of sound takes place*. Prof. Tyndall says the hand held over one sector causes an increase of sound because the vibrations of that sector are stopped. We say the phenomenon is correct; but what becomes of the explanation when we hold a larger hand, or a piece of board, over the *whole plate*, and find an *increase of sound just as before*? Try it, all ye skeptics, and see how beautifully consistent is this wave-theory. In this latter case, according to Tyndall, all the vibrations, or at least a large part of them, must be stopped; but we have a louder sound. Who will rise to explain? Tyndall says that by raising and lowering the hand, or hands, over a sector, a periodic swelling of the sound is produced. Very true. But we add that the *same thing* is produced by raising and lowering our flat board *over the whole plate!*

Possibly the wave-theorists would be glad to stop here, but we must give them the true explanation. When the hand or board is held over the plate, *close to its surface*, an augmentation of sound results. Reason: Between the hand and plate lies what may be styled a short column of air, and the *resonance of this air alone causes the increase*. When the



hand is rapidly raised and lowered again, the effect is to change the depth of this air column; and when that depth is very small, the greatest resonance occurs. Our experiments with organ pipes, sustained by the experience of the organ builders, long ago proved that a wide column requires less length than a narrow one for resonance to the same note. In this case we have a wide irregular column, *open all around the sides*. Will such a column resound? It will. We took two half inch boards, and held them *in the air*, about an inch apart, and then brought a vibrating fork over the air confined between them, and secured an increase of sound at once. The more rigidly the boards are held, the better. Of course the same explanation holds true for the whole plate and board. As a confirmation of this explanation, take a large fork on its resonant case, and approach one hand to the mouth of the case. At once a *very marked* increase of sound takes place. Use a chip of wood, a book, a piece of tin, or any object instead of the hand, and you have the same result. The more sonorous the object so held, the better the result. Will Prof. Tyndall find any "stoppage" here to explain the facts? By our theory just given, however, all is consistent and clear.

Instead of the hand, hold an open or closed tube over one vibrating sector, at once you have increased sound, and manifestly from the resonance of the air in the tube. Of course it may be answered that in the case of a tube there is nothing to stop the vibrations. Very well, we have not done with the "stoppage" far yet. Read further.

Now, as a matter of serious statement of facts, we distinctly and positively affirm that we can not find any spot in a vibrating plate, from which, if the hand or other flat body be approached thereto, we do not secure an increase of sound. Hold it over a node, hold it over the centre, anywhere you will, and an *increase of sound is the invariable result*. Why did Prof. Tyndall omit to mention this? Obviously because the admission of an increase over a *nodal line would have assassinated the wave-theory in cold blood*. It is plain to the most superficial thinker that if, when sectors 1 and 2 are moving in opposite directions at the same instant, a hand held partly over each produces an augmentation of sound, however slight, then no possible amount of logical jugglery could explain it by "stoppages" of vibrations. The fact remains that, even over the node, an increase is obtained. The simple reason, that any child can comprehend, is, that near the node, the vibrations are short and weak, just as they are near the base of a fork-prong, and consequently the sound there emitted is much feebler than at the centre of the sector, where the greatest amplitude of vibration is obtained.

Why; cannot Prof. Tyndall remember how he himself, in company with Helmholtz, Mayer, *et al*, explains at length that amplitude alone produces volume?

We have a final and unanswerable reason to present against the current explanation, but we will reserve it for the close of this article. Let us briefly notice the experiment quoted by Tyndall from William Hopkins, to illustrate interference. A tube shaped like a capital Y, has

a membrane stretched over the single end. Sand is sprinkled on this, and the double ends held over the sectors of the vibrating plate. When held over *adjacent* sectors a feeble motion (he said at first "no motion," then modified it) of the sand is observed. When held over *alternate* sectors the sand is tossed from the membrane. In plain English this is to prove that the adjacent sectors interfere and neutralize, while the alternate do not. We answer, first: Did it ever occur to Prof. Tyndall to notice the marked increase of sound when this tube is so held? This increase was not caused by the stoppage of vibrations, because he only covered a small round spot the size of the end of the tube. Now the increase of sound is manifestly due to the resonance of the air in the tube. Let Prof. Tyndall hold the prong of the tuning fork (a large one) under his tube, or hold two forks, one under each mouth of the double end, and he will find the sand tossed pretty vigorously. How? By interference? If the two forks were so held he would doubtless, say—yes, by interference. We answer, *one* will do it; but that nothing be dodged, let him attach a rubber hose to the Y tube, at the single end, carry said hose through a wall into an adjoining room, have an assistant sound two forks at the mouths of the double ends, and let him listen intently. Let the assistant try one fork, then two, &c., &c., and let the Professor cry out when the swell of sound occurs. He will find, to the utter discomfiture of the interference humbug, that the swell occurs *every time* when the two forks are "interfering." The reason the sand is tossed higher when the alternate sectors are presented to the tube is simply because these sectors swing up and down *exactly together*, hence pouring their streams of substantial sound into the mouth of the tube at the same instant; while the adjacent sectors, moving in exact opposition, pour in their streams of sound in alternation, as it is evident that the stream (or wave for that matter) from the under side can not get around and into that tube, when held so close to the plate, in time or in sufficient force to amount to anything.

To make it plainer, we recall the famous Siren exposition of Dr. Hall. The two alternate sectors swing together, hence producing a fundamental note of double strength. The adjacent sectors swing exactly in alternation, thereby precisely doubling the number of vibrations in the same time. A double vibration *produces the octave*, and of course this octave is weaker than the double fundamental, given by the two alternates, swinging simultaneously. This octave lies at the root of the whole "silence" humbug. We have shown conclusively that it enters largely into the explanation of the fork puzzle, and it alone constitutes the entire solution of the "silence" of the Chladni plates. As we said before, Dr. Hall builded better than he knew—when he, who had never seen a Siren, showed so clearly that it was totally misunderstood by its inventors and ablest exponents.

But we will now present a reason against the current explanation of the Chladni plate, so simple and so unanswerable, that the merest school boy can comprehend its overwhelming force. When Prof. Tyndall put his hand close to the vibrating sector and obtained an increase

of sound, why did it never occur to his mind to place his hand *under* the plate instead of *above* it? Now we propose, that, as a final and conclusive test, the learned Professor, *in the presence of witnesses*, takes his stand before a Chladni plate, his head and ears *above* the plate, while his hand covers one vibrating sector *beneath* the plate. He will notice *exactly the same increase of sound* observable when the hand is held above the plate, as in his diagram. Now let us pause while he undertakes to explain that the augmentation is produced by the fact that *his hand* "stops" the vibrations of this one sector.

If the *hand* stops them, it certainly only stops the vibrations from the *under* side. But the Professors' ears are not on that side. If then the *hand* stops *some* of the vibrations of the under side, why in the name of reason does not the *plate itself* stop them *all* from reaching the ears above it? We close our case, and resign the Chladni plates into the hands of the defense.

PA. MIL. ACAD., CHESTER.

MIRACLES.

BY ELD. W. F. B. TREAT.

A miracle is simply a wonder. But in our literature the term refers exclusively to that particular class of wonders denominated miracles in the New Testament. And those who are skeptical as to the claims of Christianity have affirmed of this class of phenomena: "It does not and cannot exist."

The miraculous is adjudged by these to be impossible on the ground of eternal unchangeableness in the laws of Nature. In this they are evidently in error on account of a false definition of terms. If matter were eternal and every known law of Nature unchangeable, it would not for a moment affect our claim for the miraculous. Because a miracle, properly defined, is but an effect produced by putting forth at will, and sometimes instantaneously, a power equivalent to creative or producing energy. *A miracle is not above Nature, nor contrary to Nature. It is only a power equivalent to creative or producing energy exercised in harmony with Nature.* It took no greater power to give eyesight to the blind than to give the eye itself in the beginning. It took no greater power to raise the dead, nor does it involve any greater mystery than the birth of a living child.

To the infidel one half of the testimony to any question of fact, outside of the Bible, which is given in regard to miracles, would be conclusive; and instead of attempting to evade it, he would go to work to harmonize it with his theory. It would be an easy matter for him to refer such phenomena to occult causes, the nature of which would be understood further on.

Until the infidel shall have exhausted the storehouse of infinite knowledge, he is not and can not be in a condition to dispute the existence of the law of miracles. To doubt, is the extent of his creed. He cannot deny. No recorded miracle is antagonistic to any known law of Nature. Miracles simply demonstrate the existence of an additional law in God's universe. It is admitted that some forces in Nature have been overcome or destroyed by the interposition of

miraculous power, or causes beyond the power of human science to explain. The origin of life, for example. But he who considers this a contradiction, might as well say Nature contradicts herself, because fire is extinguished by water and life destroyed by carbonic acid gas.

BLOOMINGTON, IND.

THE MODERN THEORY OF FORCE.—No. IV.

BY REV. JOS. S. VAN DYKE, A. M.

Force is convertible. Motion, when arrested, is converted into heat. Heat produces electricity; electricity, magnetism; these, chemical affinity. Light, absorbed, produces heat. Starting with any one of the forces as an initial force, each of the others can be produced. The equivalent of each in terms of the others has been carefully estimated.

For proof of the convertibility of the several physical forces I have only to refer to Grove, Faraday, Leibig, Mayer, Helmholtz, Sir Wm. Hamilton, Youmans, etc. The doctrine is now universally conceded.

If, as some assert, life is a mode of motion, then, since modes of motion are convertible, why has no one been able to explain what becomes of the life energy? Does it become heat, light, electricity, magnetism, or chemical affinity—which? We have the authority of science for saying, it is not annihilated. Into what, then, is it transmuted? Those who are able to trace each physical force through its transmigrations, and to present us its exact equivalent in each of the forms it can assume, ought to be able to tell us into what this life-mode of motion is converted. If, as Dr. Bence Jones asserts, "Death is the stoppage of the conversion of latent force into active force," then we ask what becomes of this latent force? Materialists talk of "latent force," "latent heat," "latent electricity," "invisible light," "ether," "stardust," and "mind-stuff"—though they can not prove the existence of any one of them. But the word spirit throws them into convulsions. And yet they believe in the immateriality of the physical forces.

If life is a mode of motion it must be convertible into equivalents? What is the equivalent in heat, in electricity, in magnetism, in light, of self-consciousness? What is the equivalent, say in heat, of the concentration requisite to the solution of an intricate problem in conic sections? Would it be sufficient to boil my coffee for breakfast? What is the equivalent in electricity of my intense affection for an absent daughter? Would it be equal to the transmission of precisely five monosyllable sunder Atlantic's rolling billows? What is the mechanical equivalent, in light, of anger? Is it Patrick's blinded eye? What is the equivalent, in magnetism, of my determination to become wealthy—honestly if I can, but wealthily? Is it an amount adequate to the production of such attractions and repulsives as to keep my poor soul—my mode of motion, I mean—a shuttlecock between right and wrong? Modern science has not solved all conceivable problems.

There are certain chasms which materialism has not bridged, and it is safe to say, never will bridge,—the abyss between matter and force,

between the living and the not living, between mind and matter, between the responsive and the volitional nerves of the brain. Materialists have worked hard to expel everything from the universe save matter. They have failed. Some facts stubbornly refuse to be explained on their hypothesis. Science is compelled to acknowledge that forces are immaterial and convertible; self-consciousness and musty orthodoxy will not be converted.

Force cannot be evolved from matter unless it has been previously involved in matter. Heat, light, electricity and magnetism may be eliminated from a lump of coal. Science tells us they are absorbed and imprisoned sun-light. Certainly we are safe in affirming that no force can be evolved which has not been previously involved; for that would be to suppose that an effect can exist without a cause. Matter cannot originate force. A material cause cannot produce an immaterial effect. Until it can be proved that matter is capable of originating force there will be one crushing argument against spontaneous generation. Before we can assume that inorganic matter can originate life, we must prove that an effect does not need to be contained in its cause; that the less can produce the greater; that a material substance possessing the properties of inertia, extension, figure, etc., may produce a something having directly opposite properties.

The established doctrine of the persistence of force compels us to believe that no evolver, however powerful, and no designer, however intelligent, can evolve that which has not been involved. You may unwind the strips of linen from an Egyptian mummy. You will find nothing there, but what has been put there. Nor can you divest yourself of this conviction, though ten thousand human voices are shouting, "You did not see this corpse wrapped by the embalmers; no living being saw it; no modern embalmer can tell you how it was done; it may have been done by a fortuitous concurrence of physical forces—there was no Involver."

CRANBURY, N. J.

CHRISTIAN ASSOCIATION, MORALLY AND PHILOSOPHICALLY CONSIDERED.

BY ELD. J. G. BURROUGHS.

The charm attaching to association is without a parallel in all the realm of Nature. It is true that her fields are white with the harvest of things grand and beautiful, as well as useful; but they are not equal to the charms of a sweet association, upon the basis of affinity. Everything around and about us proclaims the importance of association, and the eternal fitness of the same. The very air we breathe is given us by the association of two gases—Oxygen and Nitrogen. In certain proportions these gases have a chemical affinity for each other, and, therefore, in that proportion, blend together and form the element so essential to the life and well-being of all animated Nature. Likewise, by the association of two gases—Oxygen and Hydrogen—we have the one element called water, which is equally essential in the support of life, as we now find it. When we come to take a survey of ourselves, individually and collectively, we see that we were *born* for association. Our very organization proclaims it,

and demands it. Our general *make-up* shows the importance and *fitness* of association—in every righteous sense of the word. Our Nature is three-fold—body, soul, spirit. The body is our house, and stands associated with material things—things visible. The soul is the animal or (physical) life, of the body, or house, and stands intimately associated with every part and parcel thereof. The spirit is the man proper—the thinking, active, intelligence, vital part. The spirit acts upon the soul, and the soul upon the body—and *vice versa*, the body upon the soul, and the soul upon the spirit. Each part has a different sphere of action in the great drama of life—yet the parts are associated, and, are essential to the existence of the visible man. Destroy, therefore, this association, and you destroy, at once, man's wanted visibility in the material universe.

By the association of parts, we have the man, the animal, the plant. By the association of persons, we have society, communities, towns, cities, states, nations, kingdoms, governments, churches, etc., etc. Every organization—whatever its character—seeks its level upon the basis of affinity. As with organizations, so with individual *persons* and things. The drunkard does not seek to associate with the Christian, nor, *vice versa*, the Christian with the drunkard. The two occupy different planes of action. Hence, there is no affinity; no association. In order to a proper association, of either persons or things, there must be an affinity. This law is more inexorable than that of the Meads and Persians, in the days of Old. It obtains everywhere, and holds good in everything, and, in every sphere of life and action. Nothing in Nature escapes the force of this law; neither is there anything in the spiritual system of which the opposite can be truthfully said. A good and bad spirit cannot occupy the same place, at the same time; because there is no spiritual affinity between them, and, hence, no association.

This law of affinities obtains with *principles*, as well as with persons and things.

Christian association is based upon *spiritual* and *moral* affinity, rather than social and otherwise.

This law of moral and spiritual affinities destroys, forever, the idea of the universal salvation, holiness and happiness of all men. The apostolic injunction is, "Draw nigh to God." The promise is, "He"—God—"will draw nigh to you," James iv : 8. The enjoyment of the *promise* is predicated upon the obedience of the command—"Draw nigh to God." It is evident, then, that God will never draw nigh to us, unless we draw nigh to Him. That we may be enabled to draw near to Him, He kindly tells us what to do: "Cleanse your hands, ye sinners, and purify your hearts, ye double-minded," James iv : 8. If there is any logic in language, this shows that man is away from God, and, that he is thus separated from God by virtue of his sins. This being true, there is evidently no spiritual affinity, and, consequently, no association.

To establish, therefore, a moral and spiritual affinity between God and man, man must divest himself of sin—which is a spiritual non-affinity. Upon the establishment of this affinity there is

a mutual drawing together of God and man—according to the promise—and, therefore, a mutual association in Christ, the point of meeting and reconciliation. And, as a Christian association is based upon moral and spiritual affinities, the man that draws nigh to God—becoming thereby a partaker of the Divine nature—is introduced into a company of kindred spirits. He becomes a Christian, and is *with* Christians. He becomes a saint, and is *with* saints. He becomes an heir of God, and is *with* other heirs and joint-heirs of Christ. Paul, in addressing such a character, would say—for his encouragement—"you are come unto Mount Zion, and unto the city of the living God, the heavenly Jerusalem, and to an innumerable company of angels, to the general assembly and church of the First-born, which are written in heaven, and to God the Judge of all, and to the spirits of just men made perfect, and to Jesus the Mediator of the New Covenant" * * * "See that you refuse not him that speaketh," (Heb. xii : 22-25.)

To maintain this high moral and spiritual attainment—the association with spiritual affinities in Christ—we must carefully discard all spiritual non-affinities. These are carefully listed by the Apostle Paul as follows, to wit :—1, Adultery; 2, Fornication; 3, Uncleanliness—dirty, foul, impure; 4, Laciviousness—looseness of virtue, lustful; 5, Idolatry; 6, Witchcraft; 7, Hatred; 8, Variance; 9, Emulations; 10, Wrath; 11, Strife; 12, Seditions—discontent against government, disturbance of the peace; 13, Heresies—false doctrines; 14, Envyings; 15, Murders; 16, Drunkenness; 17, Revellings—riotous feasting, dancing, sportiveness; 18, Covetousness—penurious; 19, Filthiness; 20, Foolish talking; 21, Jesting; 22, Prostitution—and its kindred evils. (See Gal. v : 19-21; Eph. v : 3, 4, 5.)

In summing up, Paul says : "They which do such things shall not inherit the kingdom of God." What Christian can say that he is free from all these spiritual non-affinities? He that can truthfully say it, has certainly attained to a high, and most enviable, position in Christian perfection. But, true Christian association not only requires our separation from spiritual non-affinities, but a faithful working in the principles of affinity. These are : Love, peace, joy, long suffering, gentleness, goodness, faith, meekness, temperance, bowels of mercies, kindness, humbleness of mind, forbearance, forgiveness, good behavior, hospitality, honesty, truthfulness, steadfastness, holiness, unblameableness, thankfulness, prayerfulness, liberality—in support of the truth,—liberality in support of the poor; gravity, soundness,—in faith, charity, patience, speech,—Chastity, sincerity, fidelity, hopefulness, "Against such there is no law," (Paul, Gal. v : 23; 1 Tim. i : 9, 11.) In this we have a list of no less than thirty-one principles of affinity. They are principles of Christian association and true moral greatness. If the charms attaching to association—based upon mere social qualities and affinities—are great, those attaching to Christian association—based upon *moral* qualities and *spiritual* affinities—are far greater. The charms of association based upon mere *social* qualities and affinities, will end with the ebbing out of life and the closing up of the records of time. But the charms of *Christian*

association follow us into the eternal clime above, and never forsake us there. Who, then, would not be a Christian? He that would, must "draw near to God." To do this he must establish a spiritual affinity between him and his God, by "cleansing his hands of sin," and purifying "his heart." All this is effected in the new birth. Hence, Jesus said: "Except a man be born again, he cannot see the kingdom of God."

Christian association, here, is in proportion to our affinity for each other. And, this affinity is in proportion to our freedom from the aforementioned non-affinities, and, our imbibition of the *principles* of affinity. The better we live here, the better will we be prepared to enjoy the associations before and around the throne of Him who rules in love, and who keeps eternal vigilance over the "spirits of just men made perfect." Then let us, as Christians, study the principles of association, so beautifully set forth in the Book of God, and so charmingly confirmed and illustrated in Nature's great laboratory.

ROLLING PRAIRIE, IND.

THE OBJECTIONS OF REV. DR. McCABE AND OTHERS TO THE UNLIMITED FOREKNOWLEDGE OF GOD:—ARE THEY WELL-FOUNDED?

BY REV. T. WILLISTON, M. A.

The time has been when, much as Christians differed respecting predestination or God's having *purposed* all things, they were professedly unanimous in respect to His having from eternity *fore-known* all things. To the question: "How extensive is the knowledge of God?" this would once have been the unanimous response: His knowledge is absolutely unlimited. Before ushering the universe into being, all things were present to His omniscient eye; and with absolute certainty He knew all that was ever to be, not excepting the volitions, doings, and destiny of all His rational creatures. In ascribing omniscience to the Deity all Christians once understood the Word as meaning that He knows, and ever has known, absolutely all things, and that no additions are ever made to His knowledge. But such unanimity, I regret to say, no longer prevails. By writers of much ability it is now affirmed, in substance, that in its full and literal sense the word *omniscient* is not applicable to God; that—as one of them writes—His omniscience "does not imply that He now knows, or has from all eternity known, as actualities, events which may or may not come to pass, the happening or not happening of which is purely contingent on the free choices and actions of agencies which, in those respects, He has placed completely beyond His control." By one of these writers—Rev. L. D. McCabe, D. D., Professor in the Ohio Wesleyan University—a book has been issued, entitled, "Divine Nescience of Future Contingencies a Necessity." By this able writer, and by others with him, it is maintained that "in making man a free being.... God was compelled to leave his future unsettled, unfixed, and unknown." They admit that fore-knowledge is ascribable to God, and that it enabled Him to eternally foreknow a great deal—all, indeed, that He could consistently know; but if they are right, He was necessarily ignorant in re-

spect to the as yet unformed character and future conduct of all free agents. In their effort to place this Nescience Theory of theirs on a stable foundation, the old and once accepted doctrine of God's *unlimited* foreknowledge gets many a hard blow, and the new Theory is plastered all over with various objections against the old and (me judice) Scriptural one. Now it is these objections that, in this and succeeding articles, I propose to examine and answer. If successful in showing them to be untenable, I shall owe it to Him "whose eyes are upon the truth"; but whether I am able to silence the enemy's guns or not, I am sure that the oft-assailed old fort of God's unlimited prescience will outlive all hostile attacks, and will safely shelter all its defenders.

OBJECTION 1. If with absolute certainty God foreknew just what the choices and acts of angels and men would be, they could by no possibility avoid having those very choices and doing those very acts; hence, angels and men are not free agents, but irresponsible machines. What it is previously *certain* that an actor will do, *that* he cannot possibly *help* doing; and what he can't help doing, *that* he is not responsible for. In short, if to the Creator all things were eternally foreknown and certain, there is no such thing in existence as free agency, unless it be in God Himself.

The words of the above objection are mine, but they accurately and perspicuously express the views of the objectors. Simmered down their doctrine is, *certainly* and *voluntariness* are antagonistic and irreconcilable: *certainly* and a *fatalistic necessity* are substantially identical. Says one of these objectors, "If God knew before He created Judas that he would surely go to hell, then Judas could no more have avoided going to hell than he could have plucked the sun out of the heavens; and if he could not have avoided going there, then he is not responsible for being there." I am thankful for the sentence I have just quoted, for I hope to make it the means of convincing its author and all others that God's being previously or eternally certain of a sinner's ruin does not render that sinner morally impotent, or his ruin absolutely unavoidable.

That God *did* know "before He created Judas," that hell would be his final abode is made certain by the following passages of Scripture: Matt. xxvi: 24, 25; Luke xxii: 22; John vi: 64-70. If "Jesus *knew from the beginning*," or even a short time beforehand, "who should betray Him," and that Judas was "a devil"; if "it was determined" how and by whose means "the Son of man" should die, and if, as these objectors themselves believe, Judas will be forever miserable, then it is certain that at least one of our race is ruined whose ruin God foreknew. To say, as one objector does, that Jesus did not *always* know "who should betray Him," and that not till Judas had conceived the purpose to betray did Christ know that *he* was to be the betrayer, is to say what few expositors, I think, will join him in saying. Must you not admit, dear objector, that Judas' Creator "knew from the beginning" that he, of all others, would bring ruin on himself, by becoming Christ's betrayer? And if this *must* be admitted, do you persist in saying that Judas could by no possibility help betraying

Jesus and going to hell? If you do, there is no stubborn fact that completely overthrows and nullifies your false inference. *Judas felt and confessed* that in the very act which "from the beginning" God foreknew, and which you say he could not possibly avoid, *he was an unfettered free agent*. Naught but a consciousness of moral freedom and responsibility could have extorted from that betrayer the words, "I have sinned;" and that one confession, were it the only one of the kind, fully refutes the objection I am answering. *If only one person has felt guilty and self-condemned for an act that God always foreknew; or that it was previously certain he would perform, it is enough to prove that an actor's freedom of will is not interfered with by God's knowing in advance just what his act will be.* Judas' case may be viewed as a representative one; and if he was a conscious free agent in the very deed that insured his ruin, and if, as we have seen, that deed was "from the beginning" known unto Jesus, then the vexed question is forever settled that—*God's previous certainty is not man's unavoidable necessity, or the annihilation of his moral liberty.* But Judas' case is not a solitary one. If it had not been eternally foreknown that Peter would thrice deny his Master, Jesus could not have foretold that denial. Was Peter robbed of his freedom by its being previously certain that he would commit that sin? If he was, how strange, how inexplicable it seems that, "as he thought thereon, he wept." Were not his the tears of a conscious chooser? It is certain they were, and equally certain that the sin he was penitent for was always foreknown. Other cases of the kind might be cited from the Bible, but the foregoing two are enough; and while "one shall chase a thousand," "two shall put ten thousand to flight."

Let us sift Objection 1, a little further. If it be true, as that objection assumes, that act's being *previously certain to occur* renders it a forced and irresponsible act, it is plain that this inference is just as applicable to a good act and its doer, as it is to a wicked one. It would follow, then, that however good in itself an act might be, and however praiseworthy the doer, neither the act nor its doer would be meritorious or have any moral character, provided it was absolutely certain from eternity, or even beforehand, that there would be just such an actor and act. If the objection we are canvassing is well-founded, the above is a legitimate inference. Is it one that the objectors are willing to accept and act upon? Has not God rendered it absolutely certain, in advance, that the elect angels and the saved of our race will remain holy forever, and that heaven will never witness the revolt or secession of a single inmate? Will the elect angels or the redeemed be any less free or less meritorious, because theirs is a bestowed holiness, or because God has resolved to forever keep them from lapsing into sin? It will hardly be pretended, I think, that an act intrinsically virtuous would lose all its excellence by its being a divinely foreknown act, an act that it was always certain would be performed. Who will say that God's character is less glorious or adorable because the eternal law of rectitude is binding on Him, or because it has been eternally certain that He can do

no wrong? Has the eternal certainty of God's being precisely what He is, impaired His freedom at all?

Plausible as the words may sound, it is an abuse both of language and logic to say that one can *by no possibility* avoid doing that which it is previously certain he will do. To say this, is to ignore the wide difference there is between a physical and a moral inability or impossibility. When it is said of God that He "can not lie," or that "it was impossible for Him to lie," we are not to understand that it is *in all respects* impossible; but simply that so intensely does He love truth, and abhor falsehood, that it is and ever will be *morally* impossible for God to lie. He could lie if He should ever *choose* to, but there is no moral possibility of His ever choosing to. It is obvious, then, that a right or wrong act may be quite possible in one sense, and wholly impossible in another. There are moral as well as physical *can-nots*, and the Bible presents us with several of the former class; yet it represents them as being *will-nots* in reality, and therefore excuseless. Because "they that are in the flesh *can not* please God," we do not understand that they are blameless for not pleasing God. Now it was one of these voluntary and excuseless *can-nots* that enslaved Judas, and made it morally impossible for him not to be Christ's betrayer. Naught but his own covetous heart kept him from loving and befriending Jesus, or from being saved. Endowed as he was with a conscience and the power of choosing, it was as really in Judas' power to keep from being Christ's betrayer as it was in Joseph's to keep from becoming an adulterer. Both were able to discern and prefer the right; yet the one abused his freedom and yielded to the tempter, while the other resisted and overcame. The one was a devil, and loved money more than he loved Jesus, or his own soul; the other exclaimed "How can I do this great wickedness and sin against God?" To say, therefore, that if with certainty God always knew what Judas would be and do, it was *in all respects impossible* for him to be or do otherwise, is to say what neither logic nor Scripture—no, nor the consciousness of mankind—will warrant our saying. The truth, in this representative case, may be thus expressed. In choosing whether to betray or not betray his divine Master the traitor's heart was, as it were, a poised balance: the reasons or motives *for* the deed occupying one scale, and the opposing motives the other; and sometimes, probably, the anti-betrayal scale preponderated, and sometimes the other. Now the Searcher of hearts knew from eternity all these balancings for and against that would take place in the bosom of Judas, and He knew precisely which scale would finally outweigh the other. His omniscience enabled Him to foresee the final result; but it is an egregious error to affirm that if to Him the result was certain, Judas was no chooser, no balance turning this way and that way, but a helpless machine "that could by no possibility" be anything but what he was! Will men be forced to eat, work, walk or talk, to-morrow or next week, because God has ever been certain that they will? Will God's foresight in respect to these matters prevent men from obeying their own cravings and inclinations? Is it not equally senseless and

sophistical to say, that God's foreknowing what men's character and conduct will be, makes it impossible for them to form their own character, or be anything but the Creator's machine? (Answer to Objection 1, finished; and two other objections examined in the March number of the *Microcosm*.)

THE GREAT CONTROVERSY.

BY REV. J. I. SWANDER, A. M.

1. *The point at issue.* In all profitable controversy this point should be made to stand out in bold relief, and kept constantly and clearly in view, that the merits of the discussion may be seen in the light of relevant testimony and judged in the love of a righteous verdict. In the great sound-controversy now awakening such a general interest, both in this country and throughout the world, the real point at issue is one that lies back of all acoustical theories whether true or false. So far as it may have any practical effect upon the tympanic membrane, it matters but little whether sound is a "sensation" or a substance—whether it travels by waves or according to some different law of conduction. Of course it is for the glory of truth in this branch of physics that the fundamental law of the science be known and taught; but the radical question back of this most interesting discussion—the question which underlies the mission of this Magazine and *The Problem of Human Life*—is too profound and broad to find its fair and full solution within the compass of any such narrow bounds. Should the intelligent and impartial jury of the scientific world, after having examined all the testimony now being offered in the case, pronounce the corpuscular hypothesis a base pretender and a fraud, it would not logically follow that the new departure in philosophy is a tangential error. This gospel of Substantialism must first be preached in and applied to every department of the philosophic world as a witness against every manner of materialistic infidelity; then cometh the end. On the other hand, should the wave-theory be broken down before the vigorous assaults now being made upon it, the result may be heralded as strong presumptive evidence that many other cob-houses in science are built upon the sand of a false assumption. What is that false assumption? That all substances are material,—that nothing in Nature has an entitative existence except that which is measurable by the senses, or provable by mechanical or chemical tests. Against the advocates of such a doctrine we unite with Dr. Hall and others in joining an uncompromising issue. The man who denies the existence of such incorporeal substance in Nature, and the individual who, in religion, will believe only that which he can comprehend, are half-brothers in the broad family of infidelity.

But to the point at issue. In order to state it more clearly we prefer to paraphrase the language of one before whose superior ability we do ourself the honor to bow. Is there "an objective, real and spiritual world, or sphere of being from which the phenomenal world has its source, and by which it is constantly upheld"? Or, being translated into the vernacular of Substantialism, is there an order of invisible, inaudible and intangible being coextensive with

the material manifestations of God's great universe? To be or not to be, immaterially; that is the very material question now challenging the attention and respectful consideration of intellectual courage, candor and common sense. If there is such a world of being in Nature, is it substantial without being material? Upon this recently alleged Gibraltar in philosophy the guns of opposition are being trained; and from this newly announced position in science the affirmative artillery is hurling its missiles of merited destruction and death upon whatsoever worketh an abomination or maketh a lie by clinging to the superficial manifestation of things which are seen and temporal, and denying the existence of those things which are unseen and eternal. Upon this point hang all the law and the prophets of true philosophy, and upon this same point it is proposed to hang a few of the false prophets as a merciful warning for others to discontinue their adoration before the traditional gods of such materialistic idolatry.

2. *The progress of the discussion.* That perceptible progress is being made, is evident to all who have familiarized themselves with the history of this most remarkable movement in science. Look for a moment at the opening chapter of its history. Five years ago the undulatory theory of sound held undisputed sway. Its orthodoxy was admitted in every latitude of scholasticism, although the ground of its claims is as imaginary as the equatorial line from which its parallels are numbered. Taught in all the universities of learning, and supported by some of the most vigorous minds of the age, it began more recently to spread itself like a green-bay tree. While acoustical text-books and standard cyclopedias were doing service in the cause of the current theory, the truth of such teachings was suddenly called into question by the author of *The Problem of Human Life*, who stepped into the arena and laid down the challenge of scientific combat. His first appearance provoked a smile of pharisaic contempt. The average professor, supposing that in science there was but little more to learn, and nothing whatever to unlearn, fortified himself behind the rampart of his diploma, and puckered his face with pious frowns. In the meantime the champion of this new departure moved forward with a complaisancy that nestles in the bosom of deep conviction. A native of the Empire State, he came to his own with Imperial things; but his own, at first, received him not. Passing from one publishing house to another, he was made the shivering recipient of just such sympathy as that bestowed upon the immortal Homer, by the seven cities in which the poet begged his bread. How true it is that tribulation is frequently the discipline which heaven sends to school great minds for great work and greater glory. When the night of adversity was far spent *The Problem* appeared in print, and the day was at hand. The magnanimous press gave the book a chance to live. The first copy was sold to one who dared to follow the leadings of stately and startling thoughts. Men of brains read the treatise on Sound, and paused for reflection. *The Problem* elbowed its way into the world, and soon began to fly through the heavens like the angel that had the everlasting Gospel to

preach. The first editions were taken through a gradual and valuable revision. Forty-eight thousand copies have been sold, and are now being read by some of the most conservative radicals of the age. These missionaries of science are now leveling down the mountains and filling up the valleys preparatory to the triumphal march of truth.

Less than three years ago *THE MICROCOSM* was started as a co-worker with *The Problem* in a common cause. It was born upon the field of controversy, and seems to flourish upon its native air. Unlike Job's war-horse, it has no disposition to smell the battle far away. Its special mission is to cover the flanks of *The Problem* as the latter moves its steady columns forward to disperse the armies of the aliens. *THE MICROCOSM* has a large circulation among men who cling to nothing because it is old, and despise nothing because it is new. Pressing the main point in the controversy, the editor has led the way while others have followed independently to his support. His contributors are now preparing their papers with more special reference and direct application to the real question under discussion. These papers are produced, upon the terms of the Gospel—without money and without price. There are no hirelings upon the editorial staff: No commercial quantity or quality in their contributory work. Their pens are impelled by the unassuming love of truth. It is this that kindles the fires of enthusiasm along the line. May they continue to burn with increasing brilliancy until, in the broader, brighter splendor of their light, the stone which the builder's rejected shall become the head of the corner.

But the corner-stone that binds the edifice of this Substantial Philosophy is no longer so generally despised and rejected of men. The returning sun of sanity has appeared above the horizon of prejudice, and the mists of sophistry are beginning to disappear. The light shineth in darkness. *THE MICROCOSM* is welcomed into fourteen hundred institutions of learning throughout the United States and Canada, and its contents eagerly examined by students who are disposed to do a little thinking for themselves, and in whose budding manhood there is a laudable contempt for the tyranny of popular opinion and the disgusting claims of supercilious "respectability." Scores of professors, hundreds of teachers, thousands of intelligent reasoners, and an innumerable company of respectable laymen are publicly professing their faith in the new Philosophy. These are not the men who fall into every new movement at the first beating of novelty's drum; they are not ready to be shaken by the wind. Many of them scrutinized the claims of the new and re-examined the pretensions of the old until deep conviction seized their minds, and led them to embrace a more enduring substance. These men have made the transition, knowing that human majorities are not always on the side of human progress; that the theories of men may perish, while the facts of God must live; and that truth will pass to victory through flood and flame, while error dies amidst the adulations of her worshippers.

Substantialism stimulates to a new order of inquiry, suggests new experiments, and leads to new discoveries. Dr. Hall's "Finishing De-

monstration" of popular absurdity in acoustics has carried the war into the interior of Africa. His announcement that the slow rate of travel in the vibrations of the tuning-fork of only *one inch in two years* is capable of generating audible sound, is a challenge that no respectable opponent will dare despise. If the announcement is false they can easily demonstrate its falsity; if true, the coffin-lid of the wave-theory is fastened down forever, and the corpuscular hypothesis comes forward to have part in the first resurrection. We expect to hear the correctness of that "finishing demonstration" called into question. It is not likely that such men as Prof. Humphreys, of the Vanderbilt University; Prof. Comstock, of Knox College; Prof. Carhart, of North-Western University; and our own most highly esteemed friend, Prof. Stahr, of Franklin and Marshall College, will remain silent under the bold impeachment thus laid at the door of their darling theory. They had the courage to speak in its defense, while others sulked in speechless perturbation to their tents. Long live the men who dare to preach what they believe, and defend what they preach. Of course their arguments, like the theory they attempted to sustain, were full of contradictions, but themselves were consistent in making the effort. We honor them for their candor, and admire them for their courage. May their gallantry be further displayed until they either demonstrate the falsity of Hall's "finishing demonstration" or bow with unconditional surrender to the sceptre of its truth. We expect the latter. That they have not already surrendered is no matter of astonishment. Men of master minds are moved only by deep convictions. The chiefest of the Apostles was the last to embrace the religion of the Nazarene; yet, when his noble powers were once enlisted in the new cause, he labored more abundantly than they all. So shall it be with some who are now standing in the front ranks of opposition to the new Philosophy. They are honest men, and, seized by the giant hand of honest conviction, must soon abandon their position with an emphasis of recantation more honorable than a thousand years of fidelity to a falsehood.

3. *The outlook for the future* is, therefore, full of promise. That auspicious future is near at hand. Truth travels slowly, but suffers no delay. The rumblings of its approaching chariot-wheels are already filling the ears of scientific faith with the gladdening substance of corpuscular emissions. Let the mitred priests of materialism proclaim a fast, and weep between the porch and the altar of their tottering temple, while the millennial sanctuary of Substantialism rises up to stand forth, firm in its foundation, fair in its proportions, the proper pride of its founder and the perfection of philosophic beauty.

THE SUN-IS IT HOT?

BY REV. D. OGLESBY.

Is the sun hot? Scientific men say it is. The books tell us it is. But is it not possible that they are mistaken? The heat-producing rays of the sun are not hot. This is susceptible of demonstration. Then why should the sun be hot? There is no day so hot on the surface of the

earth that the cold is not intense—perhaps down to zero—only a few miles above the surface. Yet the heat-producing rays of the sun are as numerous up there, as they are at the surface of the earth. This certainly is demonstration that heat does not inhere in the rays themselves. Then, again, is it not impossible for the rays of the sun to be affected by heat? Heat is a condition of material substances. Immaterial substances, certainly, cannot be affected by it. If the heat-producing rays of the sun are not hot, how do they produce heat? We reply; by the resistance they meet in their rapid flight when they come into contact with material substances. The collision of immaterial substances with material substances produces heat, as witness the lightning. The light and heat-producing rays of the sun come to the earth in eight minutes. This is at the rate of twelve millions of miles in one minute *nearly*, or two-hundred thousand miles per second, *nearly*. The rate of speed is such that if the particles composing these rays were large enough to be seen by the aid of the most powerful magnifying glass no living creature could stand the bombardment for a moment. In all probability the world would be fired like a friction match. And as proof that it is the friction or collision of the rays of the sun with matter that produces heat, we know that the denser the atmosphere the greater the degree of heat. And we know that substances that obstruct the passage of the rays entirely, become hotter than those that only partially obstruct them. We are accustomed to the language, that some substances, as ice for instance or glass, don't absorb heat, and that is assigned as the reason why such substances do not become heated. Instead of using the word absorb, would it not be more correct to say obstruct? Through the agency of the heat-producing rays of the sun, material substances are combined, forming all the combustible matter on the earth; the forests and the coal mines, to be used by earth's inhabitants when needed. Heat is necessary to combine and lock up different elements into combustible forms, so heat is necessary to unlock and set them free again. But as it is hardly possible for the same cause to produce diametrically opposite effects, we are bound to recognize the vital principle or life-principle, in vegetation that guides and controls the work of combination and structure in combustible matter.

If it be true that the velocity of the rays of the sun produces heat as herein set forth, it may not be, and there is no reason that I can see, why it is any hotter on the planet Mercury or Vulcan, if there be such a planet, than it is on the planet Uranus or Neptune. The velocity of the sun's rays being the same at any distance, the heat generated would be the same when it strikes material substances, whether at short or long range. There would be a less number of rays at a great distance, as the rays diverge as they go out from the sun, but a small difference in the density of the atmosphere at Uranus or Neptune would secure the same degree of heat. And the outer Planets being larger than the inner ones, their greater gravity, it seems to me, would secure this affect.

If the sun sends out nothing but *immaterial* substances, how can it become exhausted? Philosophers have racked their brains to find out

how the heat is maintained—where it gets its supply of coal. Suppose it don't need any. Suppose it is not hot at all. We think that because we build fires and burn wood and coal, in order to produce heat, therefore the same process is necessary at the sun. But we forget that we are only releasing the heat already confined in the substances when we burn them.

It seems to me that immaterial substances, such as light, heat, electricity, gravity, &c., are to the material world, what the immaterial part of man—the spirit—is to the body. The material body is built up and maintains its organization by the indwelling spirit; and when the spirit goes out, the body dissolves into its original elements of matter. The immaterial constitutes the soul or life of the material. So it seems self-evident that the immaterial is superior to, and independent of, the material world. And as the sun is the centre and source of supply of our system of all the immaterial substances—light, heat, gravity, electricity, &c.,—it must be an immaterial world, in a very eminent degree. The great depot or laboratory of the solar system where immaterial substances are generated, not by decomposition or combustion, is continually supplied fresh from the hand of God. He reaches out and manipulates all the material universe, as the musical performer touches upon the keys of the instrument with his fingers. The sun experiencing no combustion, there is not necessarily any intense degree of heat there. And being the home of the immaterial substances, may it not be the home of the immaterial man, when he “puts off this tabernacle”? May it not be the home of the inhabitants of our planetary system? For the Master taught, that He had “other sheep which are not of this fold,” who were to be gathered into “his Father's house,” and that there would be, “one fold and one shepherd.” May it not be the “City of God” with “twelve gates,” whose “streets are paved with gold,” the “house of many mansions” where the redeemed shall dwell forever? Hid from our profane gaze now, by a robe of glory too brilliant to behold for a moment by mortal eye, what may not its inner glories be? I forbear to write the thoughts that are inspired in contemplating the gathering together of the good and the great, who may meet from every age and clime and nation,—from every planet of the solar system to celebrate the praises of God, and search into the present mysteries of His works to all eternity.

RICHVILLE, ILL.

THE WORLD'S HISTORY OF ITSELF.

BY ELDER S. F. WALKER.

Six thousand years ago, our forefathers were a million million miles farther away from the stars of Hercules than we are now. We are entering a region more thickly studded with stars and stellar systems than that through which they were unconsciously hurled, at the rate of 160,000,000 miles a year. But we will not reach Hercules. Our journey is to be around Aleyone, and return to this part of the stellar arena, at some later era. It has been asserted that this vast system, to which ours belongs, was once a single Nebula. There are nebulous stars now in sight, as large as the orbit of Neptune.

This gives an air of probability to the supposition that our solar system was once such a star. This theory cannot be called science; but it is supported by the fact that there is a regular gradation of density from the outer-most to the inner-most planet: Mercury is like lead; Saturn is like cork. The law of relationship between the size of a body and its period of rotation proves that the sidereal year of either one of the planets is the same as the period of rotation the sun would have if it extended to the orbit of that planet. The sun is still surrounded by nebulous matter. Comets are nebulous spheroids. The length of the tail is the radius or half the diameter. The seeming tail of a comet, is but the shadow of its nucleus luminous by its own light; all the rest of the comet's nebulous surrounding is obscured to our sight by this brightness of the sun.

In accordance with this nebular theory, it is supposed that the earth and moon were formerly one illipsoidal or spheroidal mass of igneous gas; and the detailed process is given by which they became two foci, and two worlds. They are not separate now. There is no void space between them. Ether, if there is such thing, is substance. Light, heat, electricity, and even gravitation, are substantial.

All worlds are spheroids: The more plastic, or fluid, they are, the more they vary from the true sphere. The innermost planes are densest and roundest, but none are perfectly round. A bright spot has recently been observed at the pole of Mercury that indicates an opening through that orb. The cusps of Venus show an indentation at her poles. Mars is depressed at the pole, and Jupiter still more so. Saturn is greatly bulged at the equator and is, by the same law, still ringed about by part of his original nebulous or plastic substance. A great red spot on Jupiter, six thousand by thirty thousand miles in extent, appeared a few years ago and is not entirely gone yet. It was doubtless a glimpse had of his own glowing body, through an opening in the vapors that constitute his belts.

With these analogies in view, it is not unreasonable to assume, that our earth was once a fiery spheroid, extending thousands of miles beyond its present atmosphere. It rotated then as now, and was subject to the laws of gravitation, centrifugal force, chemical affinity, polarization, contraction, etc. Then, as now, the outer region was ethereal and the inner-part most dense: the outer region cool, the inner one hot. Heat, gravitation and chemical affinity stratified the mobile mass, and rotation caused currents in the different strata; just as rotation causes trade winds and equatorial currents now. It is conceivable that these strata became rings and belts, and retained their places for a while by the momentum gained before they were detached. The internal heat was the grand supporting cause. As it declined, these belts would be left to the support of their rotary motion. They would gradually fall behind as the upper strata of air now do, until gravitation prevailed over centrifugal power, and then they would fall.

The geologist finds the earth at that stage of its progression, when it was encrusted with granite, enveloped in a boiling sea and with an outer shrouding of clouds and thick darkness. As the crystallization of the elements

into granite took place, the mass assumed its present form. As there was no centrifugal forces at the poles, they remained contracted and depressed, or funnel-shaped—like the stem end of an apple. The laws of force do not admit of polar regions being flat. No orb in space has either rounded or flattened poles. The term oblate-spheroid must be discarded. When this fact is admitted, the wonders of the North Country will begin to be realized.

The first rocks were formed by crystallization. The next series were formed by precipitation; and are miles in thickness, with no particles of sediment. Another series of Azoic rocks miles, too, in thickness, were formed by sedimentation; All these classes have, in places, been baptized in fire, rent by dikes, contorted by pressure, and transformed by heat and upheaval, until the enigmas of their history are innumerable. Sea and air were vast laboratories in those early ages. There were debacles from above, and eruptions from below. All the elements above, below and around, were in commotion; and the conditions of life to plant and animal were precarious, long after the low forms had gained a station in the Lawrentian sea. The great limestone formations, upon which our western cities stand, and out of which they are partly built, are the mausoleum of the ancient world: and we have a vision of the far-away time always before our eyes. Many species perished by violence, others had a peaceful sleep. Superior races supplanted less vigorous ones, as they still do, and in turn passed away. This was not that they might be succeeded by a superior race, for they were all incidental. The progressive principle seems rather to have been in the inorganic forces of nature. They improved the conditions of life, and improved life resulted. God is more immanent in the mineral than in the animal kingdom. The spiritual reality is beneath all.

A monumental pile upon the roadway of the eternal ages, is the coal formation. It divides geological history into two parts. Before that period there were no climates and no seasons—all was torrid heat. Animal life was almost exclusively confined to the sea, and was adapted to its heat. The sun had not penetrated the gloom of the abounding exhalations of that twilight time. The air was heavy, because of its height, and made dense by fumes and vapors. It stimulated a prodigious vegetation. Great spaces of marsh land were covered with ferns, calamites, sigillarias and lepidodendrons. Greenland and Guinea, Melville Island and Central Africa wore the same pale green attire. After these trees had breathed the air their million of years, it was fit for the breath of the crocodile, and labyrinthodons, fern, and conifers, raised high their green tops in the sunlight.

In the New Red Sandstone are found footprints of birds, and the angular marks of frost, but not in the same laminae together. There came a change of seasons in the Connecticut valley, and the birds went south in winter. The earth was cooling down. Man can say, with perfect assurance, that at a certain era, an animal of a certain kind, size, shape, and habits walked along the margin of a certain sea, at a certain place when the wind was blowing from a certain quarter, and rain falling with a certain force

and frequency, from clouds of a certain kind and color, in a certain part of the sky; and that, too, millions of years ago. But questioned as to the origin and design of any animal or its type he must answer, "Can'st thou by searching find out God?"

Pterodactylus, *Ichthyasaurus* and other long-nosed monsters, stand as representations of the long periods when Oolitic, and Cretaceous rocks were formed; and those long periods bring us down to a time when the Andes, the Alps, the Pyrenees and the Himalayas, and Sinai, and Ararat, rose from the sea—a result of the cooling, and contracting of the earth—and pelicans, bats, snipes, buzzards and sea-gulls are harbingers of the latter days. It is the Pleiocene era.

Soil has accumulated, rivers, lakes, valleys and forests diversify the landscape. Man's abode seems fitted for him, but he is not there. Fixing our attention on Northern California, we find that where now basaltic peaks and ridges 18,000 ft. high, form the tops of the Sierra Nevada mountains, was an extended plain, crossed by numerous streams. Palm groves lined their banks. These were time's barometers, and indicate the cooling process we have watched. Abounding animal life was there, as relics testify. Human relics have been reported, with the rigid care that science takes, but science has her blind side. Beneath the bright waters of those streams, were beds of gravel hundreds of feet deep. The gravel was all quartz, and nearly all white. The different strata of it alternated with beds of variegated clay, and where exposed was very beautiful. Intermixed with all this gravel, was gold; golden sands and scales of gold. At the bottom, among huge quartz boulders, were great nuggets of gold. There was no song of cotters in the mountain's dells; And o'er those waters came no chime of bells. But there was music there, for its echo lingers after all the milleniums of years. This was the Garden of Hesperides. A line of flaming volcanoes wallied its eastern side. In them we see impending doom.

The course of those limitless gravel beds is from the northeast by north; but there are no quartz mountains in that direction. The drift from the far north, seems to have been accumulating through different ages.

We come now to another monumental era. We have noted the cooling process through uncipherable periods of time. The Glacial Epoch is not an exception to the statements made. It was a temporary interruption of the changes going on, and proves the theories assumed. The cause of the glacial overflow, was the former great eccentricity of the earth's orbit. As the earth cooled its vapory envelope settled upon it. The poles cooled first, and the vapor descended there in the form of snow. This snow intensified, and extended the coldness of the poles; and they reacted upon the vapors above, so that they poured down in avalanches. Icebergs filled the channels, and glaciers covered the lands down to the temperate zones; and the temperature of the whole surface of the globe was so lowered that every mountain became a glacial centre, and even the Amazon has her share of markings, excavations and morains. In time the internal heat and the sun asserted their dominion again, and the glaciers became deluging seas.

But these floods have no connection with that of Noah. It was of brief duration—an event of yesterday.

Noah's great grandson, the mighty hunter, is, since the Assyrian discoveries, a historic character. Geological history and human annals cannot be made to link together.

The numerous flints resembling implements, found in the valleys of the Somme and other rivers of Europe, and in the Delaware, were formed by pressure of glaciers and ice; and are as unfit for human use, as the earth was then for human occupation. This subject, of paleolithic implements, needs reconsideration.

LAMONI, IOWA.

THE LOCUST ARGUMENT.

BY BARTON S. TAYLOR, M. D.

The present status of this argument appears to me to be about as follows: Those who have undertaken to answer it have brought in the aid of "elasticity." This, Dr. Hall severely and justly ridicules. Elasticity is not a thing that can do; and to talk of it as doing is, as he says, nonsense. Prof. Carhart did, however, mention the pressure of the air resulting from gravity. But he and every one else knows that gravity alone cannot produce vibrations, or back and forth motions; there must be some other force acting in antagonism to gravity. This he might have supplied by mentioning molecular repulsion acting between the molecules of air. Then we would have the gravity of the earth drawing and pressing the molecules of air together, and molecular repulsion pressing them apart, and we have the necessary conditions of vibration. These, with the inertia of the air—its tendency to continue its motion in straight lines—account for the continued spread of the air-waves started by the locust. Then opposers might say that the locust starts the first wave, and gravity, inertia, and molecular repulsion—three real agents—do all subsequent work.

But this, by no means, answers the argument. How can they account for the fact that the minute energy of the locust becomes the enormous energy necessary to move four cubic miles of air? They all hold to the constant equivalence of energy—that its quantity cannot be increased or diminished. This is not a case of the conversion of potential into dynamic energy; but this impulse started by the locust goes on spreading and enlarging until it becomes sufficient to move thousands, yes millions, of tons of matter. Now we have reached this point: either the doctrine of the unalterable quantity of energy must be given up, or else this argument completely overthrows the undulatory theory of sound. One push of the locust is not sufficient to move more than half an ounce of matter; yet this one push goes on in a continually enlarging hollow sphere, until at the distance of one mile it has formed a sphere whose area is more than twelve square miles. But as it cannot move downward, call it a hemisphere of more than six square miles of surface. Now all the air which forms those six square miles of periphery is moved, and if that whole surface were covered with tympanic membranes they would be moved by this one half ounce push of the locust. Advocates of the

undulatory theory have not disposed of this argument yet. If they think they have shown that the locust only starts the first wave, and that all subsequent work is performed by forces existing in the air, it still remains that the stream of energy started by the locust increases as it runs till it becomes several thousand times as much in quantity as it was at its beginning, which, according to their own principles, is an utter impossibility. Thus if all they claim be admitted, taking their own premises and proceeding according to their own principles, no explanation has yet been given which answers this argument.

ALBION COLLEGE, MICH.

WHY THE DIFFERENCE?

BY REV. S. C. FULTON, Ph. B.

While reading that truly great and original work of Henry George on *Progress and Poverty*, the above question arose in my mind, and, like the ghost of Banquo, it "will not down." As is well known, Mr. George, in this work, vigorously attacks the hitherto universally accredited theories and doctrines taught by all authorities in Political Economy.

The old doctrines of wages, capital, wealth, rent, etc., together with the fundamental, and misleading Malthusian theory concerning the geometrical increase of population, and the arithmetical increase of subsistence tending inevitably to pauperism, have all gone down irrevocably before his calm, but merciless, logic. He has audaciously measured swords with the veterans and champions, compelling each in turn to bite the dust. He has given no quarter either to age, reputation, or simplicity. He has caused the limbs of Adam Smith, Ricardo, Malthus, Mill, besides a host of lesser heroes to relax in black death. In a word, his work is radical and revolutionary.

Though discussing an entirely different class of topics, it continually reminds one of that other great work of his famous cotemporary, A. Wilford Hall—*The Problem of Human Life*. There is much of the same originality of conception, audacity of purpose, power of execution, and triumphant mastery of opposition, in these two epoch-making works. They are similar in style and method. Though working along different lines, they are the same, to some extent, in purpose. They agree in ridding the world of false and gigantic theories that have distorted conception and warped reasoning ever since they were started. They have all alike demonstrated that the astutest and profoundest minds can be so blinded by pet theories as to allow themselves to be carried helplessly into the most palpable absurdities and glaring contradictions. They are alike destined to revolutionize the sciences they treat.

Mr. George's work lies completely within the fields of Political Economy; Mr. Hall's mainly in the domain of Physical Science. As the author of *Progress and Poverty* has exploded the old notions concerning wages, capital, rent, etc., so the author of *The Problem* has annihilated the old wave-theory of sound, and destroyed the grounds of belief in spontaneous generation, and the evolution of man from lower forms of animal life. This is the verdict of entirely competent judges.

Now why is it that a certain class of critics, whose office it is to review such works and guide aright the public thought respecting them, give great attention to the one work, landing it to the stars, while they deign not to notice the other, either in praise or blame?

It is difficult to understand how any unprejudiced mind, carefully considering both works and putting them on their merits, can adjudge one worthy of so great praise and the other unworthy of mention. It is hard to find any inferiority, in any respect in the ignored work to the one so highly and properly commended. Nay, more. The most of unbiassed readers, capable of judging would, we think, pronounce the ignored work superior in many respects to the other.

Why this invidious difference of treatment? It can not arise from the fact that the *Problem of Human Life* attacks so audaciously, old theories generally accepted and sustained by the great leaders in physical science—men such as Darwin, Huxley, Spencer and Tyndall. *Progress and Poverty* does precisely the same thing. It cannot be because the doctrines attacked in *The Problem* are almost universally taught in the schools and colleges as science, for this is true also of those combatted in the other work. It cannot be because one author was famous and the other without reputation; for it is mainly the works in question that have made both famous. If there were any advantage in this respect, it belonged to the ignored author.

What then causes the marked difference in the treatment of the two works?

Is it not the fact that the one author treats exclusively of material interests, with only an occasional and parenthetical reference to great spiritual verities, while the other, whose work is studiously ignored, distinctly and emphatically, declares the problem he endeavors to solve to be that of human life here and *hereafter*. The secret lies wrapped up in this word *hereafter*, with all the great, precious facts and truths it represents and implies, which are so grandly set forth, and nobly demonstrated in the work which these reviewers dare not, or deign not, to recognize. Of course men leaning toward, or fully committed to, materialistic views and notions, would be slow to recognize or commend so masterly an argument undermining the very ground on which they stand, demolishing the fortress in which they confide, smiting down their leaders, and vindicating the great spiritual truths they ignore and despise.

Is not the answer to be found here? In considering the case, remember the large number of superior minds on both sides of the water, unbiassed by materialism, who recognize and appreciate most highly the great work ignored by those whose pet theories have been demolished by its illustrious author.

WILKESBARRE, PA.

"DOWSING" EXTRAORDINARY.—MR. LATIMER THROWN INTO THE SHADE:

MR. EDITOR.—In the December number of THE MICROCOSM I read your criticism on Mr. Charles Latimer, (of Cleveland, Ohio,) locating with the rod, and your pronouncing it "all a hoax and a deception." I will state what I can do, and I am willing to be tested in any way

you please. In the first place I will go to a spring and trace the stream up one or two miles, in fact any distance you please; then you may blind-fold me, and I will follow it right back to the spring. Or you may take me into a house that I was never in before, and I will locate the vegetables and tell the different kinds that are in the cellar. You may take me into any city where I have never been, and I will locate all the water pipes (blind-folded) that you lead me over. Or you may load a dozen wagons with vegetables, or minerals, or meat from different animals, and I will locate each one of them, and tell you what each wagon is loaded with. I can locate a person forty rods away—though I can't see him—and go straight to him; or any animal in the same way. I can follow a man or horse, or any animal with the rod, even if they do not make or leave any trail. I am willing to be tested, any way you please—blind-folded or any other way—and I will prove every statement I have made. I know whereof I speak. I have made this "dowsing" business a study for seven years, and can give a full explanation of it. I can also tell how, and why, so many miss the object they are looking after.

There are no hoecspocouses about it. I can explain almost anything you wish to know. I can give you a correct history of all my experience. I have made it a study not to learn how to deceive others, nor to deceive myself; and I think I understand it as well as any man living, or at least as well as anyone I have met. If you wish to hear from me again, you can write to me at Egota, Olmsted Co., Minnesota. I am not much of a scholar, as you see; but perhaps I can write so you can understand it.

ALPHONSO WARREN.

EGOTA, MINN.

THE LOUISVILLE (Ky.) COURIER-JOURNAL.

For months past a spicy little discussion has been cropping to the surface in the "Querist" department of the above named leading journal in regard to the merits of the new departure on Sound. The editor it seems has become posted and is not the man to follow the popular cry for the sake of "respectability," and at the cost of scientific truth. The following two items, clipped from back numbers of the *Courier Journal*, will give an idea of the manner in which the discussion has been proceeding:—

FRANKFORT, Ky., Sept. 18, 1883.—In your paper of September 2, to the question "Have any of the scientists, Huxley, Tyndall, Helmholtz, Haackel or Mayer replied to A. W. Hall's Theory on Sound?" You answer. "They have not, nor can they do so successfully." Being somewhat surprised at such a positive assertion from so respectable a source, and having waited two weeks in vain for some one—in the interest of popular education—to protest against it, I beg to say that, having examined Mr. Hall's book and some numbers of his "monthly," I find nothing which can for a moment throw a shadow of doubt on the mind of a "scientist" as to the received theory of Sound. Having studied and taught this theory for many years, and always with an intense desire to find out and adopt any new truth, however opposed to previous notions, I wish to say to my hundreds of old pupils who may read this column, that they may still study Tyndall, Helmholtz and

the others, on Sound, without any fear of being misled on any important point. S. G. STEVENS.

Answer.—We, too, have examined the controversy on the subject, with all the care we could muster into the service, and we say that some of Hall's positions are irrefutable. No one of those who impugned Hall's positions has successfully done so. If our correspondent thinks that he can succeed in demolishing Hall's views, let him try his hand at it in Hall's *Microcosm*, where both sides of the question are presented. We cannot open this column to such a discussion. We have expressed our opinion, and we still adhere to it. Nor do we hold to the doctrine that persons may study Helmholtz, Tyndall and others, on Sound, without being misled. No one can hold Helmholtz in higher estimation than we do. In many respects he has the best equipped mind in Germany, but he is very far from being infallible on Sound. Who has made a greater mistake than he did on the Pythagorean origin of the monochord? That was a part of his prelection on Sound. We should be pleased to see an answer to the very conclusive experiments of Capt. R. Kelso Carter, of the Military Academy in Pennsylvania. Those experiments are, in our judgment, conclusive.

EMORY, VA., Oct. 16, 1883.—Have the theories taught by that pseudo-scientist, A. Wilford Hall, gained any credence among men who really deserve the name of advanced scientists? F. S.

Answer.—Why do you call Wilford Hall a pseudo-scientist? He is anything but a counterfeiter. His ideas have attracted the credence and support of many men of large scientific ability. He can not be put down by abuse. His *Microcosm* is well worth reading, and will repay study. We acknowledge ourselves his debtor.

We think if Prof. Stevens would read Capt. Carter's Report in the December *Microcosm* on the "Swiftly advancing" prong of a tuning fork as claimed by all authorities, he would find a pretty dense "shadow of doubt" thrown over the teachings of Tyndall, Helmholtz, and Mayer. The truth is, Prof. Stevens knows nothing about the arguments he thus unceremoniously condemns. If he were game large enough for our powder, and would show his hand in *The Microcosm* in the shape of a defense of the wave-theory, we would soon convince him of the truth of the above statement. Who is this Professor Stevens?

A KIND WORD FROM DR. BALSBAUGH.

Beloved Wilford:— * * * Your brief line is more, even, than I expected. I often wonder that you have a moment to spare with your pen for private communications with any one, so crowded must you be by the duties you owe your readers through the columns of *THE MICROCOSM*. Though I often hunger for a crumb out of your heart, I remember that God has called you to a mission that reaches to the whole world and whose effects will be felt for all coming time, and I ought not and must not steal a minute or thought of what belongs to so vast a work. O that I could help you in pushing forward the work you are so nobly doing. How gladly would I, Aaron-like and Hur-like, stand at least under one arm while you deal the blows of Heaven against the Amalekites of materialism. Oh that the gracious Father, to whom belong all souls and all gold, would open the heart and hand and purse of some rich man or wo-

man, who glories in the Cross, to help place your work before a thousand where it now reaches only one. Such a legacy would be God-honoring, and would lay up for him or her a thousand fold treasure in that bank where no failure was ever known and where no cashier or paying-teller will ever prove a defaulter. My heart almost breaks to think what a burden of struggle and care and mental strain is constantly upon you as you fight the enemies of truth on the right and left, and always as regularly as the month opens send out your peerless casquet laden with jewels each sparkling with a brighter luster and sheen than its predecessor. Is it possible that no self-sacrificing man of means can be found who would proudly take part in the work that must be wearing you out? You have laid the foundation of your edifice deep and broad as eternity, and upon it a score of wealthy men might build with abundance of room for all to work, and thus free your mind and pen for the special work Providence has marked out for you to do. The temple of Substantialism that you are erecting, under the direction of the great Architect, is built of stones from the Rock of Ages. It will endure when the heavens shall be rolled up as a scroll. God keep you in the hollow of His hand.

C. H. BALSBAUGH.

THE GREAT BUFALINI PRIZE.

We have received from the Hon. John Eaton, Commissioner of the Bureau of Education at Washington, an invitation to compete for the prize of 5,000 francs offered in the will of the distinguished Italian Scientist, Maurizio Bufalini, for the best treatise on the value of experimental investigations in science over *a priori* reasoning and mere theorizing. The competition is open to scientists of all nations, and the various essays (which will be legion) are required to be in the hands of the Italian Commissioners by the 31st of October, 1884. It is hardly likely that an obscure American can stand any show of success in such an august assemblage of competitors, where counts, nobleman, dukes, and princes possibly, will contest for the fame and the francs—to say nothing of renowned scientists by the score from all parts of the world, including such men as Tyndall, Helmholtz, and others. Still, as we are invited to appear in the contest, we shall do so (D. V.), and shall have our paper in the judges' hands duly translated into *Italian*, and promptly on time, as we have signified to Commissioner Eaton. If we do not carry off the prize, we shall do the next best thing to it:—we shall have the pleasure of presenting to a most distinguished body of scientific men in Florence, Italy, on that occasion, a conclusive paper on the fallacious character of the current-theory of acoustics,—a fallacy originating solely in the want of that very experimental method of investigation in science so opportunely called for in the will of the late celebrated Bufalini. We believe we shall succeed in that paper in making many eminent foreign scientific men open their eyes wider than they have ever opened them before at the prodigious errors in physics taught in all their colleges, which a few simple experiments would have totally dissipated. Good is certain to come

out of this competition, and God will be glorified in any possible event. So, as the Apostle says,—"I therein do rejoice, yea, and I will rejoice," whether or not the prize shall fall to the credit of THE MICROCOSM.

THE EARTH'S ANNULAR SYSTEM.

WILFORD HALL, PH. D.—*Dear Sir*:—I read Prof. I. N. Vail's article in the November MICROCOSM with much interest. Some things, however, need further explanation to make them consistent with other facts that have been discovered. Prof. Vail assumes that if the earth should revolve on its axis seventeen times faster than it now does, objects on the surface about the equator would fly off as water flies from the pirimeter of a revolving wheel. If this be true, I ask why does Jupiter remain intact when his equatorial surface moves in diurnal revolution at the rate of 30,000 miles an hour, or about thirty times instead of seventeen times swifter than the earth's surface? And why do not objects rise from the equatorial surface of Saturn, which has nearly an equal rotating motion? Please, give us more light. Yours, etc.

ROCK HILL, TEXAS.

WM. ALLEN.

ANSWER TO THE FOREGOING.

The reason is very plain why objects do not fly off from the surface of Jupiter whose equator has about thirty times the rotary speed of that of the earth. There is about thirty times (more or less) the attractive force on the surface of Jupiter to pull things down toward his centre, and thus keep them from flying off. This is evident, since Jupiter is more than 200 times the mass of the earth with a correspondingly greater attractive power, which, counting distance from the planet's centre, about equalizes the centrifugal tendency of bodies to fly off on both planets. This not only makes the matter plain, but shows the wisdom of the Creator in so adjusting the speed of rotation to the size and attractive power of the planets, as to harmonize the motions of heavenly bodies.

HOW THE PROBLEM TAKES.

Elder Z. Rudolph, of Mentor, Ohio, (father of Mrs. Garfield) writes:

"Mrs. Garfield has commenced reading the *Problem of Human Life*, and she is very much pleased with it. She says she intends to read it through. I have spoken to several in Cleveland, Bro. L. Cooley, Dr. Boonton, and others, who are intending to read the "*Problem*" and THE MICROCOSM. May the Lord bless, and keep, and strengthen you for the great work you have in hand, is my ardent prayer. Affectionately yours,

Z. RUDOLPH."

Rev. W. W. Barber, of Wilcox, Pa., writes:

"I have read the *Problem of Human Life* with open-mouthed astonishment. When I now speak of the *soul*, I have some idea what it is. Success to you."

HALL & Co.:—I take thirteen leading monthly periodicals and Reviews of this country and England. That is my "bill of fare." I read from them just what interests me. I take also WILFORD'S MICROCOSM. But I never lay it down until I have read it all from cover to cover. It is all food.

HERMAN CARTER,
JEFFERSONVILLE, OHIO.

Pastor, M. E. C.

WILFORD'S MICROCOSM.

23 Park Row, New York, Feb., 1884.

A. WILFORD HALL, Ph.D. Editor and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourself responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

THE COLD AND HEAT PROBLEM.

ITS FINAL SOLUTION.

As promised last month, we now proceed to give the final solution of the Cold and Heat problem as so ably discussed by Dr. Roberts in his two previous papers. And first, we are compelled to declare, that no one, out of a score of correspondents who have attempted it, has succeeded in furnishing the "conclusive experiment" called for in our proposition, or has come anywhere near it, as each will see as we advance. They were with two or three exceptions, on the wrong side of the question, and, of course, could demonstrate nothing. Those few who were on the right side offered no experiments, but made valuable philosophical suggestions. We therefore come directly to the interesting problem discussed by Dr. Roberts, namely, is cold a positive force of Nature, as he claims, instead of being the mere absence, in various degrees, of heat intensity, as the books have laid it down? We trust that our answer, and the reasons for it, will prove satisfactory.

At first, after reading the trenchant and very argumentative papers of the Doctor, and before any one else had seen them, we were strongly inclined to accept his views therein set forth. But on revolving the question over and over, and viewing it from different angles, we thought we began to see weak points, not to say very visible flaws in his method of reasoning, till we felt sure, as stated in the December number, that so radical a conflict of views concerning one simple proposition in science could not be insusceptible of demonstration one way or the other, if the proper experiment could only be hit upon. This conclusion led us to make the offer of \$10 and a life-subscription to THE MICROCOSM, to the one who should first discover and present such experiment to our readers. Up to the present writing, we repeat, no such demonstration as called for has been forthcoming, though many valuable and quite ingenious suggestions have been called out by that offer from the scientific thinkers who read THE MICROCOSM.

As we announced last month, our own lucky star being in the ascendent, we hit upon the very experiment we had asked for, and which we think every reader of this magazine will admit settles the controversey beyond a quibble or doubt; and we are sorry to add that it settles it conclusively against Dr. Roberts and in favor of the text-books. We regret this fact because we long for something new in scientific discovery, even a thousand times more than we long for a meal when hungry; and accordingly

we greatly desired to record "victory" in favor of the elaborate exposition of the subject by Dr. Roberts as a new gem in the diadem of Substantialism. But inexorable facts, and the laws of Nature, are against us. Hence, not having been gratified in our desire for a new theory of cold, we will have to try to be satisfied with the lesser mental treat of having by mere accident discovered a new method, and the only one we can conceive of, for demonstrating the correctness of the old theory, and in such a way that no doubt will hereafter exist. We shall therefore first give the demonstration in detail, and afterward we will try to show how the misapprehensions so ingeniously shaped in Dr. Roberts' papers can be completely harmonized with the true theory, namely, that *cold*, after all, is only the absence of *heat* as *darkness* is the absence of *light*, or *silence* the absence of *sound*.

Before, however, coming directly to the solution, it may interest the reader to know how a man sixty-four years old who works hard all day, can so amuse and even fascinate himself upon a theme like this as to lose half a night's sleep for several nights in succession trying to solve a problem so abstruse that the greatest minds in the country have been compelled diametrically to differ upon it. Well, here is the secret motor-power that moved us. Lying restless one night, contemplating Dr. Roberts' problem, we chanced to think of a rhythmical *riddle* with which our dear, good mother used to rock us to sleep about sixty-two years ago, and which was then so indelibly impressed on our young mind that it became a part of ourselves, and has ever since persistently refused to be effaced. Little did that devoted mother then think that she was instilling into the memory of her sickly boy a lullaby that would solve a most knotty scientific problem, after more than half a century had passed. But first let us make due record of that highly philosophical *riddle*, for the benefit of all incipient scientists:—

"What is this that *nothing* is
And yet that has a *name*?
It hips, and skips, and nimble is
As every sort of game."

Of course the answer was—"A *shadow*," as it was explained no doubt scores of times to gratify our curiosity, while the dear woman swayed the tallow candle to and fro, up and down, to make the old spinning-wheel dance jigs upon the walls of our log cabin. Yes, here was the secret that led to our solution of the *cold* problem. A *thing* can be "nothing!" A *nothing* can have a "name." It can not only have a name, but it can, to all appearance, per-

form wonders of agility and feats of marvelous vaulting, equal to the powers of all the living men and animals on earth, and still be absolutely *nothing*, except the partial absence of a positive force of Nature! Thus the reader sees at a glance how this first-learned philosophical lesson was the scientific wedge that was driving itself into our weary brain those restless nights to keep out sleep. For if such feats, we reasoned, can be performed by an absolute "nothing," as all the world admits it to be, may not the marvelous results achieved by *cold*, so graphically narrated by Dr. Roberts, prove as fictitious, when properly understood and analyzed, as are those of the "shadow" which sixty-two years ago, we supposed to be real antics?

But now, after this digression which the reader will pardon, let us come to our new philosophical experiment by which cold is positively demonstrated to be only the absence of heat, and by which we claim fairly to have earned the \$10 offered in THE MICROCOSM:—

It is well known that if one end of a bar or rod of iron of sufficient length be heated it can remain even red-hot for any length of time while the other end remains cool so as to be comfortably held in the hand. Every blacksmith knows this, and has in his shop a hundred proofs of its truth every day. And he also knows that if the hot end be slowly inserted into cold water, or pushed into a bank of snow, the heat, being a substantial entity or thing, will at once begin to travel along the bar toward the cool end by radiation or dispersion, keeping in advance of the cooling water or snow till it will soon blister the hand, if not let go, where just before the bar had been cool. This, of course, contains nothing new. But now for the demonstrative proof, that cold is only a negative condition and not any thing substantial. Reverse the experiment by freezing one end of the bar to as low a degree Fahrenheit as possible in a mixture of ice and salt, while the rest of the bar remains comparatively warm. Now suddenly withdraw it and insert the frozen end slowly into a furnace at glowing heat, and if cold be a real substantial force the opposite of heat, it should act the same precisely as heat did in the other case—namely, it should travel along the bar toward the other end driven by the advancing heat of the furnace. But on the contrary, instead of the other end of the bar becoming cooler by the retreating cold of the frozen end thrust into the fire, *not the slightest lowering of its temperature takes place either near to or farther from the furnace!* Q. E. D.

Thus cold is demonstrated to be *nothing* as a substantial force, and is only the "name" or term by which we designate the absence of

heat, as the term *stillness* designates the absence of *motion*, *darkness* the absence of *light*, *silence* the absence of *sound*, or a *vacuum* the absence of air. Having thus, as we believe, overturned by this simple experiment the general hypothesis that cold is a substantial force, or an entity the opposite of heat, we now come to the important inquiry—how can the difficulties presented in the two papers of Dr. Roberts be explained and harmonized with this fundamental fact? We believe, since the problem is thus finally solved, that a most rational reconciliation can be made between this great truth in science (that cold is absolutely nothing but the absence of heat) with every apparently unanswerable difficulty the Doctor has presented. Let us try it. Take for example, the marvelous works that *cold* is said to accomplish—such as turning lakes and rivers, and even oceans, into solid ice; and especially take the bursting of massive iron globes and cylinders by the expansion in freezing of a small quantity of confined water, etc., etc. According to the true law of science which this experiment now settles, cold does not do this at all, philosophically speaking, but simply the radiation or withdrawal of heat does it by allowing the water to return from its *abnormal* condition in which heat had placed it to its *normal* condition in the universe of material substances, namely, *ice*. Be not startled, dear reader, when we announce what never before, so far as we are advised, has appeared in print, that, *normally*, there is not a drop of liquid water, oil, mercury, or, anything else in the universe! Normally the substance of fluids can exist only as ice. Heat is one of the abnormal or phenomenal conditions of Nature, and without which no liquid substance or even organic life would exist. Freezing into ice and expanding into greater bulk, are not therefore the action of *cold* at all, scientifically speaking, but are the effect of the natural radiation of heat from the liquid body which thereby allows it to return to its normal condition of solid ice. The bursting of a mass of iron by the expansion of a little confined water in the act of turning into ice is not therefore properly the work of cold in any positive sense, but is simply the work of heat in the act of withdrawing by radiation from the inclosed water, thus allowing it to return to its normal condition or more enlarged form of ice, which necessarily bursts the cylinder containing it—because *normally, as ice, it could never have been got into that space*. The reason why *ice* takes up more room in the act of forming than liquid, is this: the particles of water being round fall together with the greatest possible compactness

and with the least possible interstitial spaces between them, thus taking up the least possible room. Now it is evident that all the particles of a given mass of water would not radiate their heat with the same facility, or at the same instant. Hence those particles first giving up their heat will form themselves into crystalized particles of irregular shapes, which of course will take up more room than the perfectly round particles. As there is no place for them they commence wedging themselves in between the fluid particles, forcing them apart, which being almost entirely incompressible must begin to exert a powerful strain upon the inclosing cylinder; till finally, as the crystalization continues, millions of these infinitesimal wedges have formed and come into play, thus bursting the cylinder asunder. It is simply split by the action of an infinite number of mechanical wedges. That's all.

Now to say that cold bursts the cylinder, is the same as to say that *vacuum* crushes the thin glass receiver surrounding it; whereas it is only the pressing of the air which causes the collapse. By this simple key to the problem, that *normally* no water or other liquid exists in the universe, but only *ice*, the whole mystery is at one stroke dissipated. In like manner no *light* normally exists. The normal condition of the universe is one of total *darkness* as well as of absolute *silence*, both light and sound being abnormal or phenomenal conditions in Nature. In like manner utter *stillness* normally prevails throughout Nature, all *motion* being the abnormal or phenomenal condition of all substances, material and immaterial. But even more,—*substance* itself, material and immaterial, is an abnormality. The normal condition of universal space is perfect *vacuum* or nothingness, that is the total negation of anything and everything. There is and was originally but one self-existent abnormal embodiment of substance, and that is and was *God*. All other substances, material and immaterial, came phenomenally from Him, without whose all-pervading substance the whole universe would be a perfect vacuum. Thus we see how Substantialism hangs together in its basic principles, agreeing with every rationally demonstrated fact, just as a consistent system of philosophy should.

But *life*, also, is the abnormal condition of the universe, while *death* in the sense of vital extinction or nonentity, is the normal condition of Nature. One being only is self-eternally abnormal and self-existently life, and from whom all *life*, as an abnormal or phenomenal outflow, has proceeded. Call it *more new philosophy*, if you please. It is nevertheless

rationally true as well as truly rational. God alone, therefore, is the self-existent substantial and living abnormality of the universe. Without His exhaustless supply of power, and light, and heat, and life, and substance, the whole universe would be one limitless scene of normal cold, darkness, stillness, silence, emptiness and death, without one ray of heat, without one beam of light, one movement of a body or body to move, one utterance of a tone, or one spark of life to break the blank and desolate normality of universal vacuity.

Other difficulties have been suggested, such for example, as the fact that a touch of the naked flesh to ice in the polar regions, at forty degrees below zero, will raise a blister the same as would the touch of hot iron, and will even cook meats the same as will boiling water. Is it possible, it is asked, for *heat* and *cold*, both to produce the same results, and one of them be merely the absence of the other? We answer, as before, that cold does not do it, strictly speaking. Our key will unlock even this mystery. *Normally*, flesh could not exist at all. It is an abnormality, a creature of *heat* operating in a partial degree of intensity, say 86 degrees, F. Increase this heat 126 degrees, or to 212, and flesh is disintegrated or destroyed as living organic substance; reduce this same heat, which allowed flesh to organize, 126 degrees, or to 40 below zero, thus exposing it to a condition in which normally it could not have come into existence at all, and its texture is equally destroyed as living flesh or, in other words, it is *cooked*, and it will so appear when returned to that degree of heat which organized it. Hence, the canning of cooked meats is claimed to be done as effectually by the absence of heat as by its excess. Thus the *life-point* of heat for organizing flesh 86° F., seems to be exactly midway between the two extremes of heat or its absence where flesh will, after organization, become disintegrated; or, as we commonly designate it, *cooked*. Keep it at either extreme, and it will not putrify for ages,—one on account of the intensity and the other on account of the want of heat, but neither of them as the result of cold.

Then take the Doctor's experiment of rubbing two blocks of ice together to develop latent heat by friction. Of course he is right, that no heat will thus be generated if the ice is thoroughly frozen—as no heat can come from a thing that does not contain it. Take, also, the experiment of testing the temperature of different substances in a room where they are equally exposed to the same degrees, and it is easily explained by this simple philosophical

law. The iron, for example, as the Doctor truly says, is certainly colder under the same conditions of exposure than would be an equal mass of wool; not because cold is a substance, or because it can get into the iron with better facility than into the wool; but because substantial heat radiates or departs from iron with greater facility than from wool, and thus restores it quicker to its normal condition. Indeed, such is the affinity of heat for wool or fur that it will not entirely radiate for a long time, even in a region of the lowest temperature. Hence the heat of a man's body communicated to clothing of wool is retained in the woolen fiber, while a person clothed in the same weight of *linen* might freeze to death because of its greater facility to radiate or part with the heat of the person wearing it. In like manner iron, exposed to the sun's rays above a medium temperature, absorbs heat with the same facility with which it parts with it in excessive cold, or cold below a medium temperature; while with wool and many other substances it is *vice versa*. Hence, iron in a hot sun will blister the hand, while the heat of woolen cloth, similarly exposed, will scarcely be felt. How completely all this harmonizes with the views here set forth, that heat is the only real entity involved in the premises!

We could thus take up every problem presented by Dr. Roberts and others, and one by one unlock its innermost recesses of mystery by applying this key of the *normalities* of Nature. But it is not necessary. The Doctor himself can do it better than we can. He is too profound a thinker not to see that heat is the only positive force involved in the entire discussion as soon as this key is suggested, and that the radiation of heat in various degrees, leaving corresponding approximations toward absolute normality, is the all-sufficient explanation of cold in its various degrees, and which seems, superficially, to act as a positive force. If the Doctor shall hesitate for one moment in doubt as to the sweeping application of this key for the unlocking of all mysteries connected with the discussion, let him try our demonstration and he will at once acknowledge that *cold* is absolutely nothing except a formal "name" applied by universal consent to the absence of heat in various degrees of radiation, as *shadow* is a "name" applied to a *nothing*, by which we mean absence of light.

In our discussion of elasticity and force, in reply to Prof. Comstock's letter in the October *Microcosm*, the nature of the recoil of a spring after having been compressed or expanded was shown to involve a principle in philosophy almost precisely similar to this effect of heat and

cold. We have generally supposed, for example that the steel spring runs the clock for twenty-four hours after it is wound up. Philosophically speaking, it does nothing of the kind; but owing to its form and consequent elastic property, it becomes a possible custodian of mechanical force with which it is charged by the muscular energy of the arm of the person who winds it. This force, thus stored up in the steel and radiated through the clock-wheels, finally acts upon the swinging pendulum; and in this manner its effect is distributed throughout a whole day, instead of culminating instantly, the form and elastic property of the steel merely permitting such stored-up force thus to work. The *steel*, of which the spring is made, normally, like ice, is absolutely nothing as regards power or a positive force. Normally, it cannot stir itself or anything else; and as a spring, like the cold of the ice, it is simply the absence of force. In its normal condition it is not a spring at all. It is simply a piece of steel capable of being made a spring. But when mechanical force is put into it, in the act of winding, the steel begins to show off phenomena by permission of its elastic property, just as a block of arctic ice begins to show phenomena in various degrees as soon as the positive force of heat begins to take possession of it, thus converting it into water, thence into steam, and finally decomposing it into its elements of oxygen and hydrogen.

We believe there are some things in natural philosophy yet to be studied out which are not to be found in the text-books, some of which we have here presented, though we are very glad to know that the books are often right. But while they frequently hit upon the truth by jumping at it, as in the case of cold being only the absence of heat, they neither give the fundamental law for solving its apparent action as a supposed force, nor do they formulate experiments for the confirmation of such law which will leave no room for doubt in the mind of the student. These two things, as principles of action ought to be the rigid rule every author places himself under before attempting to write a treatise on natural philosophy. These principles of action rigidly enforced would have originally prevented the adoption of the Ptolemaic system of astronomy, and the same strict methods of investigation would have left no place in our text-books for that champion vagary of modern science—the wave-theory of sound.

PROF. COMSTOCK ONCE MORE.

Not being satisfied with the shape in which the locust argument was left by our comments in the October number of *THE MICROCOSM*, Prof. Comstock wrote us an article for publica-

tion, claiming to explain more fully his position and his objections to our calculations, and to show in what manner the locust could—with its almost infinitesimal strength—set four cubic miles of air into motion, throwing it into “condensations and rarefactions” 440 times in a second, as required by the wave-theory. But his letter, as on former occasions, was more evasive of the true points in discussion than explanatory, on account of the technicalities used. We thereupon wrote him, begging of him to state plainly and without any technicalities whatever or circumlocutions, just what the locust does do in the premises, and just how much of the movement of the twenty odd million tons of air displaced is due to the strength of the insect, and how much is due to the “elasticity” of the air itself. We urged upon him to leave no point in the inquiry untouched, but to state in simple form of words whether or not he believed that this trifling insect was capable of displacing the 20,000,000 tons of air permeated by its sound 440 times in a second, and with a mechanical force sufficient to move a tympanic membrane, weighing half a grain, at every cubic quarter inch of this space, or equal to a mass of solid matter in the aggregate weighing 2,000,000,000 tons. We received a letter, in reply, which, though still evasive, and far from being explicit, is such an improvement on former efforts that we now give it to the reader verbatim, with our comments:—

KNOX COLLEGE, GALESBURG,
ILLINOIS, Nov. 27, 1883.

A. W. HALL, Ph. D.—*Dear Sir:*—Yours of Nov. 23, is at hand, and I reply in as few words as are consistent with perspicuity.

1. In accordance with the wave-theory of sound, the atmosphere is in alternate states of rarefaction and condensation.
2. The wave-length is the distance between two consecutive points of greatest condensation.
3. The particles of air move forward throughout half the wave length, backward in the other half.
4. At the wave-front, particles of air are just beginning to move forward, while particles in the rear of these, at the distance of the half wave-length, have completed their forward movement; between these extremes, particles are moving forward at different rates.
5. The distance moved by any particle is very small, but the number of movements in a second is very great. Now for an explanation of the case in hand.

One stroke of the sound-producing apparatus of the locust sets in motion a shell of air, which, with ever-increasing radius, communicates the motion in succession to the surrounding atmosphere. *The one stroke sets all the air in motion as far as the sound is audible*, but not all at once. From the centre, the place of the locust, the movement proceeds outward at such a rate that *within five seconds all the air to a distance of a mile from the locust has been moved*. If the half wave-length is two and a half inches, the impulse given to the air in the first shell two and a half inches thick is transmitted to the next shell of the same thickness, and then to the next and soon, all by virtue of elasticity—just as a slight blow at the end of a row of elastic balls suspended near each other moves the whole, the motion being communicated from ball to ball. A shell of air five hundred feet in diameter, and two and a half inches in thickness would contain about ninety pounds of air; a shell of the same

thickness and a thousand feet in diameter would contain four times as much, so that the intensity of movement in the shell five hundred feet in diameter is four times that in the shell one thousand feet in diameter. Thus the force of movement decreases in intensity while the distance from the centre increases, till the sound becomes inaudible.

If the waves succeed each other four hundred and forty in a second the weight of air in the shell moving forward when five hundred feet in diameter is about five hundred and forty pounds. To move this amount of air so as to affect delicate nerves, is all that the locust has to do at *each outward stroke* of his *sounder*. Each stroke, four hundred and forty or twenty-seven hundred a second, does the same amount of work.

If the space were full of "*drum skins*" instead of air, I do not know what the result would be; but I presume the vibrations would be quite imperceptible at the distance of a mile.

In what I have written, there is nothing difficult to understand, or hard to believe, especially when compared with your corpuscular theory.

In the wave-theory, a *line* of particles of air reaching from the sounding body to the ear is made to convey a movement or thrill through its length, like a wave along a tightly drawn cord.

In your theory "substantial particles" move from the sounding body to the ear; just think of it, a little locust sends out "*corpuscles*" into every point of four cubic miles of space! Musk wastes away as it gives forth odor, but there is no waste to this locust. It loses nothing, but fills the space around with flying things.

In my *honest* opinion there is *no truth* in this "substantial" theory. Yours truly,

MILTON L. COMSTOCK.

REPLY TO THE FOREGOING.

The fundamental and, we must add, inexcusable error running through this and all previous arguments on the locust problem, consists in supposing that *elasticity* is a mechanical force, or that it can accomplish any thing at all in aiding a given mechanical force to displace a material body by overcoming its inertia. We have denied from the start, and have illustrated it in various ways, that elasticity is any kind or degree of force, or that it can accomplish any thing whatever. It is simply a property of matter that permits certain qualities or kinds of motion in a body by the application of external mechanical force, but it in no way adds a grain of force to the mechanical effect. The property of *ductility*, for example, in certain metals, may just as correctly be called a force because it will permit the metal to be drawn out into wire. Prof. Comstock really claims, after being driven into a corner (though he afterward contradicts it), that the locust has only to start the air-wave by a single "stroke of its sounder," and that the whole mass of air is displaced or moved "all by virtue of elasticity." The same thing was urged by Prof. Humphreys of Vanderbilt University; Prof. French of Urbana University; Prof. Carhart of North-western University, and a dozen other professors who unfortunately for them have at various times attempted, in an evil hour, to meet this locust-argument. Each one claimed substantially in the language of Prof. Humphreys, that "the *wave* as soon as it is started *moves of itself*, and the locust has no more to do with it."

Now, such professors ought to claim, by the same mode of reasoning, that after one "stroke"

of the wire-machine is applied to a copper rod, and one inch of wire is drawn out, the rod ought to go on and draw itself out into yards of wire "all by virtue of its" *ductility*. Or after the glazier starts the cutting of a pane of glass and has proceeded "one stroke," that the diamond ought to go on and cut the pane in two "all by virtue of" its *hardness*. Why not? One is a property of matter as much as another, and one is no more a mechanical force than is either of the others; though each of these properties permits mechanical force to produce certain results in accord with the character of each body acted upon. Is there a child, anywhere, old enough to go to school that cannot see this?

From the foregoing reasoning it is plain that the movement of the insect's sounding apparatus, as the only mechanical force involved or possible to conceive of in the premises, must overcome the inertia of the 20,000,000 tons of air 440 times in a second, by its physical strength alone if the wave-theory be true, the same as if, instead of air, it were a single suspended mass of ivory weighing that much. Bear constantly in mind that the elastic property of the air only permits a certain mode or manner of distributing the mechanical force and resultant motion from the source of power throughout the mass of matter to be moved, and that in no possible way does it add a single grain of force to the original mechanical energy of the insect that gave the impetus. It does seem almost like an imposition upon our readers that we should be obliged minutely thus to refute such transparent nonsense as that the elasticity of a body furnishes mechanical force in helping to overcome its inertia. Yet this is the central teaching upon the subject in every college and university in the land, and upon which the present system of acoustics essentially rests.

But Prof. Comstock, after insisting upon this view in various previous letters, and intimating it here—that the entire effect of displacing and condensing the 20,000,000 tons of ponderable matter is attributable solely to "elasticity," the locust merely giving the impetus to the air directly in contact with its organism,—goes on in various ways flatly to contradict himself and totally to overturn his "elastic" solution. Shall we point out a few of these self-contradictions? Here is one: "The *one stroke*," he says, "*sets all the air in motion as far as the sound is audible, but not all at once.*" What is it, Professor, that "sets all the air in motion" and thus overcomes the inertia of 20,000,000 tons of ponderable matter? Why, the *one stroke* of the locust's legs! Thus by his own showing the *elasticity* of the air does not do it, but "the *one stroke*" of the insect's "sounder" does it, while the elasticity of the 20,000,000 tons of matter merely permits a certain character of motion to take place as all must see, if the air is really moved at all as the wave-theory teaches. How a sane professor of physics could thus deliberately stultify himself by claiming, as he has repeatedly done, that "the *one stroke*" only disturbs the air directly in contact with the insect, and that the four cubic miles are afterward moved by "elasticity," and then, that "the *one stroke sets all the air in motion*," is a problem we leave for the president of Knox College to solve. The revealing phrase—"but

not all at once"—does not help him any; for the locust keeps up its stridulation for nearly a minute, and the Professor admits that "within five seconds all the air to a distance of a mile from the locust has been moved"! Thus he admits that for nearly a minute the locust is actually displacing and keeping in motion the whole 20,000,000 tons of inert matter, and repeating this power at the rate of 440 absolute displacements every second! Does such puerile stuff as this need to be refuted? We suppose so, as it is an integral part and parcel of the science taught in all the colleges and universities in the land.

But the Professor is not content with this first childish self-contradiction. He supplements it with another still more glaring. After repeatedly, in his various letters, urging that the locust only exerts its direct strength upon a cubic inch or less of air immediately in contact with its vibratory organism, and that all the rest of the disturbance is produced by the "elasticity of the air," he now backs squarely down and extends the direct mechanical exertion of the insect to a "shell" of air 500 feet in diameter actually weighing 540 pounds! Reader you must believe it, for here it is: "The shell moving forward when five hundred feet in diameter [two and a half inches thick, as he had just given it], is about 540 pounds. To move this amount of air so as to affect delicate nerves is all that the locust has to do at each outward stroke of its sounder"!

Well, we give it up. Why in the name of science the Professor should pick out a particular "shell" of the four cubic miles of air, only "500 feet in diameter," and "two and a half inches in thickness" weighing "540 pounds," as the extent of the insect's displacing force and not include the thousands of smaller shells nearer to the locust, and the tens of thousands of heavier shells outside of this 500 foot circle in which the sound is audible—each and all just as much the direct "work" of the locust as the particular "shell" he selects—is another of those supremely preposterous mysteries of current physics which we commend to the merciful consideration of the colleges and schools where this Magazine is read.

But even this is not all, nor the worst of this miserable fiasco. Why, reader, the Professor becomes so pitifully confused in this first outspoken attempt to meet the locust argument in an intelligible way so that the common mind could grasp it, that he absolutely admits that the insect's "stroke" upon the four cubic miles of air is the same precisely as if, instead of air, the 20,000,000 tons had consisted of solid matter. Here is the proof: "All by virtue of elasticity, just as a slight blow at the end of a row of elastic balls suspended near each other moves the whole, the motion being communicated from ball to ball."

Now we are sorry, for the sake of Knox College, that Prof. Comstock should thus publicly commit scientific suicide; but he has done it, and there is no help for him. What is it that "moves the whole" "row of elastic balls suspended near each other"? Let the Professor himself tell; "A slight blow at the end of a row of elastic balls suspended near each other moves the whole, the motion being communi-

cated from ball to ball." A truer sentence than this was never uttered in exposition of a principle of natural philosophy, nor was there ever uttered a more fatal blow at an accepted theory of science. The "slight blow at the end of the row" of glass or ivory balls of course "moves the whole," and the elasticity of the balls permits the mechanical force of the "slight blow" to be distributed throughout the row or from ball to ball rather than being all expended and limited to the first ball, or the first few balls in the row. Now apply Prof. Comstock's honest illustration to the case of the locust. Its "slight blow" at the small quantity of air in contact with its stridulating organism "moves the whole" four cubic miles of air, if they move at all; "the motion" of "the slight blow," of course "being communicated from ball to ball" or from particle to particle. It is thus the "slight blow" in both cases that "moves the whole," Professor Comstock himself being the judge; elasticity having no more to do with the displacement of the whole mass in the one case than in the other. But to show the folly of the wave-theory, in the light of this excellent and scientifically correct experiment, let us try the locust and its kicking power on this row of glass balls suspended near each other. Yes, we will even do better for the Professor than he has done for his theory. We will suppose the balls actually to touch instead of being "near each other," with the exception of the first two in the row, and these to be, say, an eighth or a quarter of an inch apart. Now let the locust kick the first glass ball moving it against the next, which we will admit to be possible, provided the balls weigh not more than an ounce a-piece, or in bulk about an inch in diameter. This "slight blow" thus moves the first ball against the second with a faint click. Suppose now that there are 64 of these balls in the row, weighing four pounds in all, can any one believe for a moment that the slight mechanical force exerted by this insect will be conveyed through the entire row overcoming the inertia of the 64 balls so as sensibly to drive the last ball away from the row? We do not believe that there is a Professor of physics in America, if left to his sober scientific senses uninfluenced by the necessities of the wave-theory, who would entertain such an impracticable supposition for a moment, but would conclude with us that such a "slight blow" exerted by the strength of the insect barely moving the first ball against the second, would expend its force in the next, or at most in a very few of the next balls in the row, and that not a particle of the force would be conveyed as far as to the sixty-fourth ball. Yet what does Prof. Comstock teach? He actually teaches, by using this illustration, not only that the kick of the insect would "move this whole" row of balls, but that it would exert a force capable of moving 20,000,000 tons of such balls (glass being still more elastic than air), or a row reaching, in round numbers, 440 times around the earth! This is actually what the wave-theory requires if it be true science, since the scale-weight of the four cubic miles of air thrown into motion by the "slight blow" of the locust is admittedly more than 20,000,000 tons. Nay, more. Since this insect's sound can only be heard, according to the wave-theory, by the bending inward

out of the tympanic membrane, weighing half a grain 440 times in a second; and since the sound of the locust can actually be heard at any space large enough to contain such a drum skin within the four cubic miles, say at each cubic quarter inch, it follows mathematically and mechanically that each space of air of that size is shaken with a force sufficient to bend such a membrane whether present or not, or with an aggregate force sufficient to displace 2,000,000,000 tons of drum skins! There is no getting away from these figures, and Prof. Comstock knows it. Hence he does not, in all his criticisms, dispute their accuracy; but childishly supposes, though repeatedly contradicting it, that all this prodigious displacing and shaking force is exerted by the "elasticity" of the air after the locust starts the first tiny condensation at its diminutive legs. But the unfortunate Professor has here overturned it all, by his row of elastic balls. He thus hits upon the truth, and tells us exactly what it is that "moves the whole" row;—that it is not their elasticity by any means, but that "a slight blow at the end of a row of elastic balls suspended near each other *'moves the whole.'*" So the "*slight kick*" of the locust "moves the whole" 20,000,000 tons of air with a mechanical force sufficient to move 2,000,000,000 tons more of solid, unelastic, tendinous drum skins! Apply this addition of estimated mechanical force (which Prof. Comstock does not question) to the long line of glass balls and let the locust kick one end of it, and instead of moving a row extending 400 times around the earth, this "slight blow" ought to overcome the inertia of a row one hundred times that length—or passing 40,000 times around the earth, if there is a grain of truth in the wave-theory. We challenge Prof. Comstock, or any believer in the wave-theory, to overturn these frightful exposures of its absurdity; or to show that our figures are exaggerations of the mechanical consequences involved in and growing out of said theory. In particular do we invite Professor Comstock to write us another article, grappling directly with our exposition of *elasticity* as the mere property of a body, analogous to that of *ductility, malleability, porosity, fusibility, combustibility*, etc., and that in no manner or degree does it exert mechanical force or aid in overcoming the inertia of a body; *its whole office being to permit a certain kind of motion or quality of effect through the application of adequate mechanical force.* This we claim to be new to science. Will Prof. Comstock show that it is not true philosophy.

But the professor tries to console himself with the thought that all these demonstrated absurdities involved in the wave-theory based on the achievements of the locust are not hard to believe, "*especially when compared with your [our] corpuscular theory.*" This is all owing to the fact that Prof. Comstock knows nothing about our theory of sound, and has not yet grasped the first element of *Substantialism* upon which the corpuscular theory is based—namely, that sound is not a material but an incorporeal substance. If he had taken this first or initial lesson in the Substantial Philosophy he would have seen no difficulty in accepting the fact that a locust may fill four cubic miles with substantial sound-pulses, and

do this a hundred times over, without using up its physical structure, *since the emission of incorporeal substance takes nothing from the corporeal structure that generates it*; though the act of generating, as in case of a vibrating instrument, may wear out or disintegrate the instrument itself in time. Or, as in the case of light, its process of generation may consume the luminous body by burning it up. But the emission itself of the incorporeal light-particles from the candle while consuming, constitutes no part of such consumption or disintegration *since such particles, not being material, have no ponderful value.* Other bodies, as is well known, neither consume nor wear themselves out while emitting immaterial substances. Take the permanent steel magnet, which is capable of generating unnumbered cubic miles of substantial magnetic rays in the years during which it is emitting such force. Yet, it weighs precisely the same at the end. Odor, even though a material substance, is so near to the border-land of absolute incorporeality that a grain of dry musk will fill probably hundreds of cubic miles with its substantial odorous corpuscles, and still weigh so nearly the same that no druggist's scales can detect the loss. The error of Prof. Comstock is best illustrated by this sentence, which we quote from his communication as printed:—

"In your theory substantial particles move from the sounding body to the ear: just think of it, a little locust *sends* out corpuscles into every point of four cubic miles of space!"

We don't require to "just think of it" at all; as the gist of his statement is the very blunder wherein lies the great misapprehension of the opponents of Substantialism. The locust "*sends* out" nothing. It simply generates the substantial sound-corpuscles by the rapid vibration and resultant molecular action of its stridulating organism; then these substantial pulses dart off through the air, or whatever medium like other incorporeal forces, by unknown laws of radiation adapted by Nature to suit each particular substance. But this has never entered the mind of Prof. Comstock, and cannot till he shall grasp the elementary principles of the Substantial Philosophy as now taught in this magazine. He will then see that it would be absurd to suppose that substantial currents of electricity are *sent* off as he expresses it, through the iron wire at a velocity of 100,000 miles in a second by the motion of a dynamo-machine, and that they are *sent* just as swiftly when the machine revolves slowly as rapidly! He will then probably have his eyes opened to see that the trifling molecular motion of a burning taper hardly "*sends*" substantial light-corpuscles at a velocity of 180,000 miles in a second, or even "*sends*" Prof. Tyndall's "Jelly"-waves of "ether," should he prefer them to corpuscles of light! He will then learn that substantial rays of magnetism shoot off from the magnetic poles without any motion in the steel particles, whatever, to *send* them, and by a law of radiation unknown to mortals. Surely such a motionless magnet does not "*send*" them!

When our learned critic shall have become aware of all these things, by studying the principles of Substantialism, he will be in a fair way of learning many other things in science

that were never dreamt of in his old philosophy.

We have thus, we trust, relieved Professor Comstock's mind of its difficulty in accepting the Corpuscular Theory on account of the ask the locust would have to perform in *sending* sound-pulses "into every point of four cubic miles of space," since all incorporeal but substantial forces, go without *sending*, as we have seen, by a law of conduction or radiation provided for such substances by the Author of Nature. But now let the Professor relieve our mind and the minds of our readers as fairly and logically of the difficulty involved in the task of the locust in actually *sending* out air-waves, constituted of *inert, ponderable, material* substance that will not stir or travel an inch, only as it is *sent* by the application of external mechanical force. Let him show how this inert material substance, weighing 20,000,000 tons, is not only *moved* at "every point in the four cubic miles of space," but *compressed* also with sufficient mechanical energy to generate heat, not only in sensible and measurable quantities, but as the wave-theory distinctly teaches, *enough to add one hundred and seventy-four feet a second to the velocity of the insect's sound, all by its own physical strength!* Here is a real difficulty, which Prof. Comstock would fain cover up by parading a purely imaginary one about the Corpuscular Theory which we have just shown to have originated solely in his misapprehension of Substantialism. Readers of THE MICROCOSM in every State and Territory in the Union, as well in every civilized State on this globe, will now look for an honest and manly surrender of Prof. Comstock to the new Philosophy upon this subject. It remains to be seen if he will have the moral courage to do it.

In conclusion we call the reader's attention to the suggestive fact, that Prof. Comstock says not one word about the "swiftly advancing" prong of a tuning-fork *at a demonstrated velocity of one inch in two years*, which Prof. Tyndall says "*sends*" the inert, material air-waves off through the air at the velocity of 1120 feet in a second. Here are his words:

"Thus, also, we *send* sound through the air and shake the drum of the distant ear."—*Lectures on Sound*, page 5.

Then, to throw back Prof. Comstock's supposed but mistaken difficulty at the Corpuscular Theory—"just think of it, a little locust *sends* out" material air-waves "into every point of four cubic miles of space," shaking a mass of inert matter weighing 20,000,000 tons! "Out of thine own mouth will I judge thee!"

We will only add that we trust the students of Knox College will force Prof. Comstock to examine Capt. Carter's Report in the Dec. MICROCOSM, and then compel him to show his hand by either admitting its truth or attempting to expose its fallacy.

PROF. STAHR AND THE "REFORMED QUARTERLY."

Just as we expected, Prof. Stahr is finally and irretrievably squelched; and the illusion is lifted from the minds of the hundreds of Reformed Ministers and other intelligent readers in that denomination who take the *Reformed Quarterly Review*, and also read THE MICRO-

cosm, who faintly hoped that something of a redeeming character would appear in the January *Quarterly* to prevent that star in the great denominational college at Lancaster, Pa., from going out in utter scientific darkness. But their last hope is now extinguished. The January *Quarterly* has come, and the silence of a deserted graveyard reigns throughout its pages on that important theme upon which Reformed hopes had attained such a high pitch.

In the December MICROCOSM we gave the final note of warning to Prof. Stahr that, unless he did something definite and practical to redeem his scientific reputation in regard to his "Two-Edged Sword" which he brandished so defiantly against the *Problem of Human Life* in the July *Quarterly*, his days, as a reputable professor of physics were numbered. We there called his attention to the "finishing demonstration" against him and the wave-theory of sound which we presented in our final argument in the October MICROCOSM, and promised if he would overturn that one argument that we would renounce Substantialism as a mistaken Philosophy. We begged of Dr. Apple, Editor of the *Quarterly*, not to oppose such effort on the part of Prof. Stahr, should he be disposed to make it; but as the responsible party for bringing out the original "Two-Edged Sword," and as the head of Franklin and Marshall College where Prof. Stahr occupies the chair of physical science, that it was his moral, religious, and scientific duty to his church and the world to urge upon Prof. Stahr either to answer our "demonstration" or make a frank confession that he had committed a grave mistake in his original assault upon the "*Problem*." To the mortification and grief of every candid patron of that *Quarterly*, not a word appears upon the subject, either from the professor or the editor. Perhaps it was expecting too much of human nature thus frankly and honestly to confess what both Dr. Apple and Prof. Stahr know in their secret consciences to be the truth, namely, that the very foundation of the wave-theory of sound was swept away by our arguments, leaving it without the hope of a possible reconstruction in the future. We know that it would have been naturally humiliating for a professor who had so learnedly and authoritatively challenged our reply and called us an "ignoramus" on the doctrine of acoustics to come out and confess his own complete ignorance of the whole subject. Of course he had the horns of a trilemma to select from—either to do this, or to try to make another defense for the theory he is teaching, which as he knew would have been worse for him in the end, or to hide behind the chair of physics in that great college and put a padlock upon his pen. The latter horn he has chosen, and now hangs there pitifully dangling before the gazing world wherever that *Quarterly* and THE MICROCOSM are read.

While pride of position may partly excuse Prof. Stahr from an honest and public confession of the truth in the premises, we see no possible excuse for Dr. Apple. There is no sacrificial offering upon the altar of pride for him to make, except possibly as to the bare fact that he made a mistake in admitting the original document from Prof. Stahr; and he

has already admitted that he did it reluctantly. Why, then, has he not decided, in an open and Christian manner, to take the bull by the horns and satisfy the urgent wishes and even demands, as we happen to know, of his most intelligent readers by frankly saying that Prof. Stahr was wrong and that the wave-theory has hopelessly broken down. To say that Dr. Apple does not know that our "finishing demonstration" annihilates the current theory of acoustics, would be to impeach his intelligence as much as his present lamentable silence impeaches his Christian candor. Why, then, has he not made a clean breast of it? Such a course would have been noble, manly, Christian, and worthy of his honored position as editor of one of the foremost *Quarterlies* of the world, and as the head of one of our great American Colleges. We leave him, in the name of Christianity and in the name of education, to settle the matter with his brethren, with his own conscience, and with his God.

OUR LIFE-SUBSCRIPTION OFFER.

At the time of this writing, our offer of life-subscriptions made last month to those who purchase at one time \$15 worth of our books at lowest wholesale price for cash, seems to meet with general favor. One man, however, asks how we can afford to carry, year after year, subscribers who do not pay? It is all very plain and simple, and we will not keep it a secret from our readers, though we have not yet made application for a patent. Every man who buys \$15 worth of our books and puts them into circulation, thereby sows seed in a new soil that is positively certain every year thereafter to yield fruit enough, directly and indirectly, in the shape of new orders and new subscribers (who would not otherwise have known of our enterprise) to pay the first cost of supplying the original life-subscriber with his *MICROCOSM*. This idea is, of course, new to journalism, and under our peculiarly favored circumstances, is as safe to the publishers as it is advantageous to the life-subscriber. Not one publisher, however, in a thousand, if there is another one in the world, could thus reckon with certainty on the future as we have done; for the very reason that no other publisher has the peculiar seed to scatter, in the shape of such books as will surely return new fruits year after year in the manner we indicate. So we are not in the least afraid of others stealing our thunder, as they cannot steal it should they try. Besides the above considerations every life-subscriber will look upon *THE MICROCOSM* as a part of his own property, so to speak, and will miss no opportunity of speaking a kind word for it, thus constantly, one way or another, aiding its circulation. Since its commencement we have carried thousands on our free list every year, many of whom we sometimes fear have valued it, at its cost. We propose a change at the end of this volume; and instead of the thousands we are now carrying who have not paid a penny, we will try a few hundred life-subscribers who, by ordering the books stipulated, will justly earn all we can do for them in the future.

As an illustration of the nature of this ven-

ture, we are receiving hundreds of orders, weekly, for single copies of the *Problem of Human Life* from all parts of the United States, accompanied with the stereotyped remark: "I saw the *Problem* by mere accident at the house of a friend, and must have a copy for myself;" or "A friend who had purchased a copy called my attention to it and recommended it so strongly that I have concluded to send for it," &c. In reading the book such persons see the notice of *THE MICROCOSM* and being favorably impressed with the book they naturally want more of the author's writings, so they send for the Magazine. They there see a notice of *Universalism Against Itself*, and the bound back volumes of *MICROCOSM*, and so conclude to send for them, &c., &c.; and this is the way the one sale of a copy of the *Problem* has, in hundreds of instances which we could give, led to a subscription for *THE MICROCOSM* and to a final purchase of one copy of every book we publish. As a single instance, Dr. G. W. Watts, of La Fayette, Oregon, incidentally heard of the *Problem* from a friend who had bought one, and he sent to us for a copy to examine. So impressed was he with the importance of its circulation that he has since ordered for cash, and sold to new readers, several hundred copies of that book. Many similar instances could be named. This, in a word, is the secret of our ability to offer life-subscriptions on the terms proposed, and it explains in a nut-shell why it will pay us to carry such life-subscriptions free. And this also fully explains why no other publisher in this country can afford to make a similar offer. (See the proposition on last page of cover, then send for the \$15 worth of books, making your own selection, and have the word *LIFE* stamped in red ink on our subscription book opposite your name.)

"DEATH OF DEATH."

During the first volume of *THE MICROCOSM* we took occasion to refer twice to this beautiful book by our highly esteemed contributor and friend, Col. John M. Patton, of Virginia. We sent several orders to the publishers as the result of those notices, not having any of the books on hand ourselves with which to fill orders. Many who then read the work were highly pleased with its intensely Christian spirit and classical style, which is emphatically the style of the author. We concur fully in those favorable impressions from our own reading of the book. One or two intensely orthodox purchasers of the book complained that it was rather too liberal in its treatment of the attributes of God as a merciful and universal Father. But it is better to err on the side of mercy, than to run to the other extreme. We candidly believe that the tendency of the *Death of Death*, can only be toward softening the asperity of the human heart wherever it is read without prejudice, and with that feeling of love for God and the human race that was evidently uppermost in the writer's mind while producing the work.

We have now on hand a supply of these books, and will send one on receipt of the price, \$1. Or, we will give one as a premium for three subscriptions to third Volume of *THE MICROCOSM* with the money—\$3.

THE INFINITE AND INFINITESIMALS.

BY PROF. J. R. SUTHERLAND.

Dear Dr. Hall.—I have been so closely occupied in my ministerial labors since having located at Ellsworth that I have not been able to engage in the conflicts of *THE MICROCOSM* with "Science falsely so called."

I have not, however, failed to read the excellent contributions of others; and thus keep posted as to how the battle goes on.

Some time back while riding on the railway, I became acquainted with a somewhat thoughtful and educated man who, though a reader of the *Microcosm* and an admirer of Wilford's ingenuity and ability, entertained this very curious and plausible objection to the doctrine of Substantialism, which I shall state in substance and attempt to discuss.

Substantialism sets forth (1) that God as a substantial being, originally created matter out of His external substance, filling space with suns, worlds, and systems, which are therefore parts of the infinite whole, hence the doctrine that God made the worlds out of nothing is rejected; and (2) that created spirits are, likewise, infinitesimal parts of God's spiritual essence, "For we are also His offspring," created out of His infinite and eternal being.

Objection. "Material things are finite; man, created spirits, are finite. The theory makes finite things parts of the Infinite. It is a mathematical axiom, that 'Every part of a thing is commensurate with the whole,' hence by the theory of Substantialism, we have Infinite space measurable by finite parts, and the Infinite Spiritual Being commensurate with finite beings; for, if we are parts of Himself or created from parts of Himself, every part of Him is commensurate *with* Him, as a whole; but if Infinity can be measured by finity it must therefore be itself finite—then is all space rendered finite, and the Infinite God Himself thus rendered finite, which is absurd.

"Dr. Hall objects to the dogma that God made all things out of nothing, because it is an impossible conception. I cannot conceive how that the Infinite can be measured by finite parts and yet remain Infinite; therefore, I must regard one theory as no better than the other. How can the finite be the *image* of the Infinite? For 'God created man in His own image.'

In answer to these arguments I positively deny, first of all, the existence of such thing as the finite in the absolute sense. It is only a relative term.

In the Universe of Matter and Spirit there exists only the Infinite and the Infinitesimal considered in the absolute. This is proven by the calculus. The Infinite is inconceivably great. The infinitesimal is inconceivably small.

"In pure mathematics it is the relation of quantities, rather than their absolute values, with which we are concerned."

Two infinitesimals may be compared with each other, or both with a third, and so on, whence has arisen the conception of the finite as an accommodated term. In like manner two infinities may be compared with each other, or both with a third, and the result be the same.

But it may be urged that we can conceive of the special limits of the sun or the planets with many other material objects.

How? Only as compared with each other; but attempt to compare them with Infinite Space, and they become infinitesimally small.

Conceive the earth's orbit to be a solid ring, which viewed from the nearest fixed star would appear no larger than a lady's finger ring.

Move out into space ten times farther, and it would appear very much smaller. Move out until you can conceive it to be invisible. Where would the earth be? How much nearer the bounds of space would you be? Manifestly no nearer than if you stood upon the earth.

In this way may be illustrated how material objects are infinitesimal parts occupying infinitesimal parts of the Infinite Universe.

We may reason in a similar way about created spirits, and the Uncreated Infinite Spirit "of whom are all things" provided we do not fall into the error of regarding spiritual infinity as spacial infinity.

That we can not conceive how the infinite may be measured by the finite and remain infinite, demonstrates that space, duration, God, time, and created things, whether material or spiritual, must be considered in their proper relations as Infinites and Infinitesimals, or contrary-wise, as finites to finites, which is opposed to our intuitions of these things.

We may conceive of two infinite quantities so related that one divided or measured by another will give a definite result, or a result that comes within the range of our conception. The same may be conceived of two infinitesimals.

But we can readily see that infinity divided, or measured by the infinitesimal must invariably give an infinite quotient.

In like manner, the infinitesimal divided by an infinite quantity must give a result infinitesimally small.

Then will Infinite space, or the Infinite God, measured by their infinitesimal parts, remain infinite; and the necessity for trying to conceive how the Infinite may be measured by finite parts is wholly unnecessary, since such relation cannot, and does not, exist. The problem for accounting for a finite image of an Infinite God I leave, with these suggestions and explanations, to the consideration of the venerable and revered Editor of *THE MICROCOSM*.

ELLSWORTH, ILL.

A REVOLUTION IN JOURNALISM.

THE MICROCOSM is confessedly the journalistic revolution of this age. So hundreds of Ministers, Doctors, Professors, etc., write us. Without prestige, influence, wealth, experience, or credit,—alone by dint of the mental efforts of its Editor and his volunteer contributors put into readable papers—has it sprung from nothing, and in less than three years reached the acknowledged foremost rank among original magazines, either in this country or Europe. Even during its first year of existence it reached a permanent circulation of near 20,000 copies, and has been growing steadily in popularity and favor ever since. It is now, at the commencement of the second half of the third volume, and is rapidly on the increase—hundreds of ministers and teachers volunteering to act as agents, and send us the names of new subscribers.

One special reason for this universal feeling of interest in circulating *THE MICROCOSM* is the fact, as recently stated by a contributor, that it is the only strictly scientific journal in the world that unflinchingly nails the banner of religion to its mast-head, and the only such paper that is not saturated with the infidel doctrine of evolution. This single combined fact has caused it to be hailed with joy by thousands of clergymen as the harbinger of a new era in church progress, and as an *oasis* in the scientific desert of journalistic literature, many declaring, in their letters, that it is doing more to meet the arguments of scientific skeptics and materialists and to confirm the wavering in their hope of a future life, than any dozen religious and purely denominational papers in the land. We let the Magazine speak for itself in this regard, though occasionally making extracts from such friendly letters.

As this number begins the second half of Vol. 3, we shall send a few copies as samples to ministers in different States who have not yet become acquainted with the merits of *THE MICROCOSM* as a revolutionary religio-scientific journal. We ask all such who chance to get this copy to read it through, and then subscribe if they shall consider it worthy of circulation. Subscriptions can either begin this number or from the commencement of the volume (August 1883). We advise all, however, to send for the back numbers of this volume, of which we keep on hand a constant supply. They contain the most important series of articles on various questions that should be preserved for future reference.

REV. PROF. GOODENOW ON ELASTIC FORCE.

Last month we printed, with only a single remark of comment, a very critical paper on elastic motion. Few of our readers were aware of the real bearing and tendency of that paper. But another, on the same theme, more fully elaborated from the same pen, lets the scientific cat out of the bag, so to speak, revealing Professor Goodenow as intrinsically a wave-theorist on the sly, and quietly playing into the hands of Tyndall, Helmholtz, and Mayer by the powerful under-cuts of his tremendously critical pen. This paper removes the disguise, and reveals the professor as the strongest opponent of Substantialism yet brought into the arena. We shall print his paper, next month, with a sifting reply from our own pen. We propose that this new phase of the sound-discussion shall come very near touching the bottom of the subject So wait.

THE PROFESSORS STILL SILENT.

That "finishing demonstration" has proved a case of veritable "interference" and resultant "silence" in the Sound-controversy. Not a single professor, out of the scores that were ready some time ago to pounce upon our new departure in acoustics as the essence of absurdity, now has a word to offer in trying to meet or even weaken the force of our calculation which so completely demonstrated the slow motion of the tuning-fork's prongs while still sounding audibly. Such a case of "silence"

by "interference" would be a godsend to wave-theorists, if they could only make their bogus "law" of that name accomplish it. But they cannot do it, nor can they obtain a result even approximately approaching it. Now we are forced to ask, if all the boasted scientific candor and love for the truth in natural philosophy have taken an everlasting departure from our great colleges and universities, so that not one professor among them dares to come out and either defend the wave-theory against our "finishing demonstration" or honestly confess that the theory has broken down? Look at the demonstration as again mathematically carried out in Capt. Carter's Report, and printed in the December *MICROCOSM*. By this entirely new method of measurement of the rate and distance of the prong's travel while sounding, the Captain, by using a superior tuning-fork, was enabled to record as small a distance as the 64,000,000,000th of an inch as the actual extent of swing, or about one million times less than the extreme limits of the best microscopes. This, reduced accurately, gave the prong's entire travel during a second as only at the rate of *one inch in four years*, which allowing *one half* (an abundance) for swifter travel at the centre of each swing, made the prong's swiftest rate of travel, while still sounding audibly, only the inconceivably slow motion of *one inch in two years!* Yet the wave-theory teaches that this slow rate of motion in striking the air must send off the "condensations and rarefactions" thus produced, which are supposed to constitute sound, at a velocity of 1120 feet in a second. That is to say, while the prong is thus travelling one inch the air-wave would travel 1,695,000,000,000 inches, or in round numbers *twenty-seven million miles!* Such is the almost infinite absurdity involved in the present theory of acoustics as universally taught in our colleges, and which the great professors of physics are now being called upon to defend. No wonder, the reader will naturally conclude, that a professor who thinks anything of his future reputation would not be willing to undertake to defend such a theory. Then, if they dare not defend it, let them acknowledge its fallacy, and *THE MICROCOSM* will forgive them.

DEUS-HOMO.

BY REV. J. F. DIENER.

The Christ-question will ever remain the highest question of religious thought, and every man who values "the excellency of the knowledge of Christ Jesus," will seek to form such views of the God-man, as will both harmonize with Scripture and true philosophy. The Christological Science of the past has satisfactorily settled four points, at least, in reference to the Person of Christ. These are: His Supreme Divinity; His true Humanity, together with the continued distinction of these two natures, and their inseparable union in one personality forever. These points are no longer under dispute among the orthodox. But there are other points which are not yet settled, and doubtless they will never all be fully reasoned out in this world so as to be free from reasonable objections.

In this article, the writer desires to present

his own view on this theme in a number of theses, not, however, with the intention of exciting controversy, but simply in the exercise of a privilege which belongs to every Christian, and he would be glad to have the views of the editor on the same subject.

The merest outline can be attempted, to avoid undue length, and so our theses must stand unsupported by any arguments, and with only here and there an explanatory remark.

1. The Christ of the New Testament is the predicted Messiah of the Old.

2. Christ is the Logos of St. John's Gospel, and the Son of God, the second Person (or Substance) of the Godhead.

3. Christ, as the Logos, existed from all eternity with the Father, possessing a peculiarity distinct from the Father and Holy Spirit, but, nevertheless, one with them in substance or essence.

4. This peculiarity of the Son gave Him a position in the Godhead subordinate to that of the Father, but superior to that of the Spirit.

5. The Incarnation of the Son, and the manner of it, were occasioned by the sin of man.

6. The Son of God, or the Logos, in becoming flesh, laid aside His Divine *Form* of existence, but necessarily retained the Divine Nature and attributes.

7. The Incarnation was a self-limiting process, voluntarily submitted to by the Son.

It was the Son who became incarnate, but the mysterious incarnating process was the work of the Father and the Spirit.

8. This mysterious process brought about a unique personal union between the Divine Nature of the Logos, and His assumed human Nature. The personality of the original nature became the personality of the human Nature, *i. e.*, there resulted, in the unifying of the two natures, a *Divine-human personality*.

9. The personality constitutes the common centre of the two natures, and in this common centre the two natures unite and blend in a most intimate union and communion.

10. These two natures, thus uniting and blending in the personal consciousness of the God-man, are never mixed or confused, nor is there any transference or communication of the attributes or properties of *either nature* to the other. The properties of the two united natures, are, however, common to the concrete person.

11. The Logos, having become man, "became subject voluntarily and during His whole life to all the laws and limitations of human nature."

12. Brought thus into the sphere of the human, the God-man "developed Himself in a truly human manner," and manifested all the essential attributes of humanity.

13. In His historical development from childhood to manhood, the God-man showed Himself free from all sin. He was "holy, harmless, undefiled, and separate from sinners."

14. His subordinate relation to the Father, along with the fact of the self-limiting of the Logos-Nature during His earthly life, furnishes the explanation of the otherwise inexplicable features in the inspired narratives of His life and work.

15. The Incarnating process brought to the Logos-Nature a period of *unconscious ex-*

istence, and, afterwards, of a gradual growth in consciousness.

16. During the period of His humiliation, the God-man did not share with the Father and the Spirit in the government of the world.

17. The atonement of the God-man is universal, but redemption is special and limited.

This view accepts all the *essential* features of the older Christology, especially the four great facts already mentioned; it does not give us a "dormant Deity," in Christ during His life on earth, while yet it secures a perfect development of His humanity.

WHITE HOUSE, PA.

SENSATION IN AMPUTATED LIMBS.

ED. MICROCOSM.—In Louisiana, Pike Co., Mo., lived a few years ago, a celebrated surgeon, Dr. Bartlett. His son related to me the following:—Dr. Bartlett was very suddenly called upon to amputate the fractured or broken arm of Mr. Stark, Sheriff of the County of Pike. The broken arm was nicely amputated, and by the friends buried as is customary in such cases.

Mr. Stark complained very much of great pain in the small finger of the buried arm or hand. The Dr. (Bartlett) was called in. He (the Doctor) believed that such suffering might possibly be caused by an improper burial of the amputated part. So he took up the hand (arm), straightened out the little finger and placing cotton nicely between the fingers, he re-buried the arm very carefully, and there was no more trouble or pain suffered by Mr. Stark. These are the facts in the case. Dr. B., is known as a first-class surgeon, and as a man whose statements are not called in question. Yours truly, J. B. BRADLEY.

REMARKS ON THE FOREGOING.

Prof. Bradley of the Christian University, at Canton, Mo., is not the man to state such facts as the above unless he had quite reliable evidence as to their correctness. We have in former volumes printed several statements of similar facts from reliable sources, and have called upon scientific thinkers and investigators for an explanation. If the incorporeal organism in man is a real substantial entity, and the exact counterpart of the physical structure, as Substantialism teaches, this certainly would suggest an explanation. The amputation of the physical arm does not, according to this view, take away entirely the incorporeal arm whose form remains connected with the living body. Yet it does take enough of such incorporeal arm to retain its form also in the severed limb, and thus keep up a sympathy between the two till decomposition in the buried arm takes place. Who can offer a more rational solution?

REV. DR. STONE ON "NOTHING."

WE have a telling paper from the Rev. M. Stone, D. D., of Omaha, Nebraska, on the possibility of creating "something out of nothing," with five positive Scripture proofs of the fact never brought forward. We shall print this important paper next month with our reply.

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THOUGHTS CONCERNING GOD.

BY REV. GEORGE SEVERANCE.

Theism and Atheism are the antipodes of each other. The intellectual world, from the remotest times, has had its Atheists and its Theists. The ancients produced a Democritus, a Leucippus, and an Epicurus, disciples of Atheism. Theism gave the world a Socrates, a Plato and an Aristotle, representatives of the Theistic school. We have our modern Atheists and Theists, whose names we need not enumerate. Either Theism is false and Atheism is true, or Theism is true and Atheism false. Pretentious as Atheism is, its defenders can affirm no more than—it is a mere hypothesis. No one ever can prove flat, as an ism, it is grounded in fact. Were we to treat Theism as an hypothesis, it may be far more plausible, hypothetically, than its opposite.

In turning to the materialistic side of things, and considering the attenuated condition to which the groser forms of matter can be reduced, when we reflect that the most solid metals can be changed into impalpable gas, when science teaches us that the very atmosphere contains in solution substances analogous to the material of which the earth is composed, and when it is ascertained weighs a certain amount to the square inch, and when we learn that the aroma of the rose is sublimated matter, we propose to pause before accepting the conclusions of Modern Materialists, believing St. Paul's the sounder philosophy. We look not at the things which are seen, but at the things which are not seen; for the things which are seen are temporal, but the things which are not seen are eternal. We have what is commonly denominated the system of created things; and to make the complement complete, the logical conclusion is there must be a Maker. In view of modern discoveries and developments, the thought is very plausible that, by the ontological route we map, we unmistakably approach the very throne of the Infinite and Eternal. Notwithstanding the endless negations of skepticism, the prospects brighten and the mists of unbelief are being dissipated. Owls and bats may be semi-intelligent, but an unclouded vision would reveal to them the unseen. Our modern Agnostics may be intellectual in some directions, but clearer intuitions might remove many a doubt.

Evidently the author of *The Problem of Human Life* has touched the key note to the Divine Existence. An abandonment of the idea that God created all things out of nothing, and substituting the ideal that all things were created out of His own fullness, is putting Theism on a proper basis. It furnishes premises from which rational conclusions can be reached. It is no marvel that men are Atheistically inclined, when Theists base their argument for a creative Intelligence on the postulate that He created all things out of nothing! There is

neither scientific nor biblical authority for such an allegation.

We behold the universe around us; the beauty and symmetry thereof set us in search of God; and as the artist is revealed in his works of art, so we have an expression of God's omniscience and omnipotence in the vast works of creation. When a river empties itself into the ocean we naturally trace it to its fountain, and find that the fountain is always higher than the stream that flows from it. There is such a thing as causation, and the cause must be superior to what is caused. The idea that God is all in all, and that the visible creation originated from the exterior part of Him who is all in all, is not repugnant to right reasoning. There is a sense in which we can use the lines of Pope in speaking of God, without trenching on Pantheistic ground:

"Whose body nature is and God the soul."

Divest me of my corporeal part, and you have not in the least deprived me of my identity. Pluck out my eyes, remove my ears and lop off my limbs and I am still myself, capable of mental effort. Annihilate the external world, and God, as its spiritual author, is omnipotent and as omnipresent as ever. No skeptic will deny that the most potent forces in Nature are impalpable; in a sense they are spiritual.

As a propagator of my species, there are prominent points of resemblance between them and myself; and though I were to beget an hundred children my identity would be as intact as though I never propagated one. The substance so visible which marks the identity of my offspring, originated in the exterior part of myself. As the identity of God is spirit He remains intact, though the universe of worlds leaped forth from His exterior selfhood without detriment to Him who is the life and light of all created existences.

The fears expressed by many are groundless, allowing we plant ourselves on the foregoing basis, that Pantheism is inevitable. Personal consciousness, is what constitutes individuality. God is an individuality, and each human being is a distinct personality; numerous as may be my begotten offspring, each is an individual, though my looks are reflected in the faces of each and all. Individuality is not interfered with by the hypothesis which concludes that God created all things out of Himself, so long as we cling to God's intellectual personality and the mental personality of all, said to be made in His divine likeness. There is an impassable gulf between this type of Theism and Pantheism proper, which is merely a modified name for Atheism. Accepting the view that all existences originated out of the exterior part of God's selfhood, the individualities and diversities in Nature are not made less personal, nor is there danger that we may some time be again lost in the infinite personality. His purpose evidently embraces the plan of the endless perpetuity of our conscious identity through the ceaseless ages of eternity.

In approaching this subject it is no concern of ours if the theory that all things were created out of nothing is relegated into nonentity. When Columbus had settled down in the conviction there must be an undiscovered hemisphere to reveal the earth in its true light as a spheroidal body, he could not stop to concern himself about the reasonings of men who thought his opinions were not in accord with Scripture. Men may misinterpret the Sacred Record, but a scientific fact is a divine revelation; preconceived opinions to the contrary, notwithstanding.

It has passed to a sort of truism: "The undevout astronomer is mad." To stand out under the canopy of the starry heavens, on a beautiful night, and to say in one's heart there is no God, is next door to denying one's identity. If we approach the infinitesimal parts of creation, the wonder and awe-inspiring influence is none the less. "I am, O God, and surely Thou must be."

Let us not fear to look Atheism in the face. The world, in theory, has always been theistic, and it ever will be. Atheism is a sort of excrescence. It goes counter to all our intuitions. Atheists are the exceptions, not the rule. As light and knowledge increase, let us avail ourselves of the labors of those who make spiritual realities appear more real.

Let nothing get between us and God, to obscure His scientific revelations. Let God be true, though every man were a liar.

Let those who demur at the conclusions of the editor of *THE MICROCOSM* touching the evolutionary processes of God as it respects the source of all created substance consider the remarks of Rev. Albert Barnes, in his introductory Essay to Butler's Analogy:—

"It is a maxim, we think, which should rule in the hearts of Christian men; and most of all in man that ministers and serves the altar, that the world is to be convinced that Christians are not, of necessity, fools. And in doing this we care not how much of sound reason and true philosophy and the analogies of Nature are brought into the sacred desk. The truth is that religion sets up its jurisdiction over all the operations of the mind. And the truth is, also, that those who have done the most to vilify and abuse the use of reason, have been the very men who have incorporated the most of false philosophy into their own systems of divinity. It is not to be concealed that the most ardent desire of the enemies of religion is, that its ministers and friends should deal out fierce denunciations against *reason* and set up the system of Christianity as something holding in fixed defiance all the discoveries of knowledge and all the schemes of philosophy. More than half the work of Atheism is done if the world can be persuaded that Christianity contemplates the surrender of the deductions of reason into the hands of infidel philosophers; nor do we know a more successful artifice of the enemy of man than the schemes which have been devised to effect such a disjunction and to set up the Christian plan as something that stands in irreconcilable opposition to the course of Nature and the just processes of thought."

In this encounter with the champions of unbelief, blows are to be given as well as taken. Quarter should not be asked, nor should it be

given. God, Immortality, and human accountability hold an inter-relation. The blow that damages one, will also the other. "The weapons of our warfare are not carnal but mighty, through God, to the pulling down of strongholds."

SOUTH ROYALTON, VT.

THE EARTH'S ANNULAR SYSTEM.—THE RECORD EXAMINED.

BY PROF. ISAAC N. VAIL.

We have seen the primitive earth a boiling and smoking mass of liquid fire. We have seen its waters, formed in the telluric laboratory, raised to the heavens. But when the earth rolled through space a glowing sun, it sent up also *mineral and metallic* matter vaporized and sublimed from its inmost depths. Iron is an essential and universal constituent of the world. Then iron vapors arose with aqueous matter, and rode with it on high.

Calcium and oxygen were there. Then the dissociated elements of lime were added to the rotating vapors. In fact, while law is law, we are forced to admit that the great primeval atmosphere was one *compound of the vaporized elements of which the molten world was composed*. Is it necessary for me to show the spectroscopic analysis of suns and stars to prove this? Surely not, while my readers are men of reason. Then all the minerals and all the metals fusible and susceptible of evaporation by the heat of the molten mass were represented in that atmosphere. This being a self-evident fact, we will next inquire how these elements deposited and located themselves.

In the first place our unerring master, philosophy *Law*, affirms that when the vapors in the heated atmosphere were allowed to condense, the heaviest would settle near the earth, and would be arranged about it, according to their *specific gravities*; and further, that these heavy substances would *fall first* to the earth accompanied with their associated aqueous vapors. In other words, that the first aqueous rocks or sedimentary deposits would be those very mineral and metallic substances located in the *innermost section of the Earth's Annular System*. That is the first-found aqueous or stratified rocks *fell to the earth* with the first fall of waters, that formed the first ocean that deluged the earth; and, therefore, the claim made by all geologists that "*all sedimentary rocks came from the ruins of pre-existing continents by aqueous denudation*," is forever laid aside, and geologic time necessarily greatly diminished. This is really a sufficient demonstration; but here, as in all departments of our theory, we have a supplementary proof of the point in hand. We find upon opening the record, that the first sedimentary rocks are precisely what this view demands; we find so far as the hammer of the geologist has opened the door, the rocks formed in the primeval ocean are the original metalliferous deposits of the world. They extend as a mighty metallic band, or casement, around the planet. Pilot's Knob and Iron Mountain, immense masses of nearly pure iron, are planted on its iron sills. The lead and galena deposits, the copper, the silver and the gold, have there their original home. The iron

mines of Sweden and Norway are in this formation. In short, wherever these Archaean piles come to the view of man, they demonstrate the very fact here maintained—that they are characteristically metalliferous. Now imagine, if possible, a formation several thousand feet in thickness encasing the entire earth, piled up as the *debris* of continents, assorted by oceanic currents, and divided into formations of iron, lead, copper, etc., intermingled with all the minerals of the greatest gravity on earth, and then notice the capabilities of the ocean to do such a thing to-day. The utter impossibility of such work under law, relegates the idea of continental degradation to its quiet grave. There were *no rivers*, and probably *no continents*. Geologists, seeing trouble from this source, conceive that many of these feriferous beds are derived from marine vegetation. But this ridiculous and stupid reconciliation, plunges them into deeper difficulties. Where did the vegetation get its feruginous food wherewith to form mountains of iron? Emphatically it must have been in the first ocean that fell. But why invent a marine vegetation to produce it, when it was already produced. But it happens to be a demonstrable fact that *no vegetation then existed*. All the geologists who have examined the Laurentian column have failed to find a satisfactory trace of a fern, leaf, twig, or stem, or any *fragment* of one. Thus by teaching one error, a grand truth is hidden from view, and a multitude of other errors perpetuated. But where are the metals and minerals that *must* have fallen from the annular system, which, we *know*, *must* have been sent up from the earth's thousand centres of inveterate fire? Lo the profundity of God's wisdom and foresight in extracting the metals from the inaccessible depths of the earth, and placing them *within the reach of man*! Falling as a mechanical sediment, and afterwards covered by vast thickness of rocks, and subjected to heat and metamorphism from *mechanical pressure*, they have followed the requirements of physical law.

Thus the Annular theory having been firmly established, demands that the first sedimentary or aqueous rocks *should* be metalliferous, while it is a universally admitted fact that they *are* such, and the theory comes forth from the very first examination strengthened for further search. But as I have elsewhere shown, if the foregoing be the true origin of these primitive beds, they should have fallen more abundantly in parts distant from the earth's equator. The investigations in these formations have been confined chiefly to the northern hemisphere; and agreeably to the above requirement the evidence is abundant and conclusive that these primitives thicken towards the North. In Canada they are known to attain the great thickness of 47,000 feet. (Logan, Dawson et al.)

Again the pendulum vibrating more rapidly as we approach the poles can be explained *only* by the fact that such matter—beds of great specific gravity—is *more abundantly located in those parts of the earth*! This must be true, *for it is law*. In the primeval declension of the annular system such deposits were *unavoidable*. The heavier sediment would form beds where the *vapors fell*, and the lighter would be borne toward the equator.

We will now pass upward leaving a fruitful field of evidence, and pause awhile at the great *lime rock* formation of the Silurian age. The Silurian lime stone is, like the metalliferous of the Laurentian, a *universal formation*. Now geologists ought to *know* that such beds could not have been derived from those first aqueous beds, since they did not contain that material in anything like sufficient quantities to produce them. The claim made by geologists that these calcarious deposits were formed by secretions from animal organisms is admitted, but this does not explain the mystery in the least. Those animals found the *lime in the ocean*! The question is, whence was it derived? To say it was derived from Millipores in the Silurian seas, is puerile in the extreme. To say it was derived from Archaean terranes in which not a hundredth part of calcarious matter existed, is equally weak and absurd.

Now it is well known that the calcarous matter of those terranes, as well as that of the Huronian beds, is *magnesium* in character. Then if the following lime rocks were derived therefrom they would also be magnesium. But they are almost a pure *carbonate of lime*, while in the *Upper Silurian* beds thousands of feet above it, a massive thickness of *magnesium lime does occur*. Thus the very formations that should be magnesium, if "derived from *pre-existing rocks*," is *not* one; and that which should not be, *is* a magnesium formation so pure, that it is considered *dolomitic*, over vast continental areas. These are obstacles which the current theory can neither surmount nor circumvent. The new theory most felicitously explains the entire host of the phenomena without one exception.

The Silurian waters fell from the "*Great Deep*," with all this stupendous mass of lime, associated with them. But if they did thus descend, they followed the same *law* and fell in greater *quantities toward the poles*, and the infinitesimal particles of lime would float *far* toward the equator, into abyssal and quiet seas, and become food for animal organisms; while in more polar lands the Silurian beds would be heavy mechanical deposits. Now it is useless for me to go over the geologic record to *prove* that this is the actual state of things. The geologic world *knows* it to be the case. The purest lime deposits and the *heaviest* are southward, in the northern hemisphere, and the *coarse mechanical* beds of the Silurian age lie northward. Thus the very apparent variation of the law in the heavy lime beds southward, *adds strength* to the theory; and the conclusion is unassailable that, just before the beginning of the Silurian age, there fell a mighty ocean of waters upon the earth, that were strongly impregnated with the carbonate of lime, and *with it fell the life germ of that age*!

Now there are seven conditions that must have obtained, if such an ocean of water did fall at that time; and any one can see that if these several conditions existed, immediately after that age began, the Annular Theory is moored to a rock that no power can move. These conditions are as follows, viz:

1st. There must have been a sudden change in the character and condition of the waters of

the previously existing ocean, and a comparatively sudden extermination of living organisms, if they then existed.

2nd. New life forms must have come in, in harmony with the new environment.

3rd. These new forms must have been such as could have lived in seas strongly impregnated with lime.

4th. This fall of waters must have been attended as I have previously shown, by a downfall of polar snows, and arctic conditions of climate.

5th. The terrific agitation of waters by flood and ice should cause the first bed of the Silurian series to be of coarse sand and gravel; and as I have shown above, these beds should be heavier toward the north, in this hemisphere.

6th. There must have been during a vast length of time before each fall of waters, a warm climate, occasioned by the over canopied vapors, followed by arctic cold and ice action.

7th. Immediately following *each and every downfall of vapors* whereby the oceans were deepened, continental upheaval, crust-folding, and crumpling of strata should take place, occasioned by an expansion of the *bed rock* of the ocean in consequence of the increase of *rock heat*, produced by the increase of mechanical pressure upon them, as the oceans were augmented and deepened,

Let the reader understand this seventh proposition: that each foot the ocean deepened, increased the *mechanical pressure* upon its bed; and an increase of heat being an absolute necessity, and *expansion an unavoidable consequence*. Upheaval must have followed every extensive fall of waters.

Now in the geologic world it is well known that all these conditions accompanied the opening of the Silurian age, save perhaps the first in respect to sudden extermination, which is not determinable on the account of the excessive paucity of living forms; and the sixth in relation to a previous warm climate, also not determinable.

But at the close of the Lower Silurian after the carbonate of lime had been deposited after a warm climate as far North as 72° lat., there fell an ocean in which all these phenomena obtained. I might here say, however, that all geologists are not agreed upon the evidence of an arctic climate. There is the sudden change in oceanic waters: Abrupt extermination of living organism, new life forms in abundance, coarse detrital beds at the base of the new series, which series ends in a series of *magnesium lime deposits* that could not by any possibility have been derived from previous formed beds. And, immediately following this augmentation of oceanic waters occurred extensive continental flexures, and crushing, and foldings of rock.

Again and again these same things occurred, and in the *self same order*. As we proceed upward in the column they become more and more apparent. The Devonian age closed, and the Carboniferous age was brought in, by a universal *display of all these seven conditions*. Again, in the Carboniferous age the world became a universal *green-house* from pole to pole. It was cleared by a terrific sweep of waters, followed by the mighty glacier, altered by extermination of species, and *stupendous upheaval on every continent*. Geologists look with

amazement upon the remarkable order of events. Is it not wondrously strange that the continents should always, as Dr. Dawson expressed it, take a "*plunge bath*" in the deep *just before the formation of new mountains*, by the bending and heaving of Strata? This feature, as well as the rest, can not be explained, if it be not admitted that the earth was each time flooded by the very waters that heaved the Strata when they receded to the ocean, and *added to the mechanical pressure* upon its bed. Now let us view these things in the light of the Annular Theory. Any one can see that these are the very things that the annular system requires *should* have taken place, and when we see their oft-repeated *recurrence* in the same inviolate order, we are forced to admit the truth of the theory, even if we had no other evidence than the geologic record. But the theory has been *previously established* by unsailable proof, and we stand amazed at the irrepressible harmony of the record therewith.

Thus every step is but a link of evidence in the wondrous chain. Now let me ask the philosophic reader, why it was that continental emergence, and mountain making, as shown by the record familiar to all, was *preceded* by continental submergence? Why were the continents baptized, and their inhabitants hurried to death by terrible floods, just before the up-raising and folding of the Appalachian mountains? And again, before the rise of the Cordilleras? Again, before the rise of the Alps, and the Himalayas? And why, as may be easily proven, did the forces that caused their formation come from the direction of the oceans bordering them? The oceans' beds were the seat of the energy exerted. I am bold to assert it, as a demonstrable truth, that these mountain ranges could not have been formed except by the declension of the annular system. Continental elevation, and the mountain flexures are the legitimate result of the potential energy of the deep on high as it fell and rolled its waves to the oceans.

There is enough water in the terrestrial oceans to make fifteen falls or deluges, even of sufficient magnitude to cover the entire earth 1,000 feet deep; and this water receding to the oceans would be sufficient, by mechanical pressure, *alone*, to raise the temperature of the subjacent beds about twenty degrees. But this would cause a mass of sandstone of one cubic mile to expand from seven to ten inches in all directions—an expansive force that no resistance could curb. But the rocks *thousands of miles in extent* expanding in all directions, and especially in the direction of the shores or continents, must force the fundamental rocks to expand to a vastly great extent, under the continents; and also to force vast quantities of matter as an interpolation, lifting the rim of the continents as we see on the coasts of the whole world. We see this action going on at this age. In the Mediterranean sea the constant accumulation of silt from the adjoining lands, is accounted for, pound for pound, in the terrific outbursts of Vesuvius, and the phenomena of other regions in the sea borders.

I neglected to state in former papers that the oceans of the earth start more than 100 feet higher on the sides of the continents than they did in the Adamite age. There are no physical

questions in the Annular Theory more fully settled than this: If such a fall of water were seen and recorded by some Moses of this age, methinks the record in Genesis would not seem so very extravagant.

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**GOD'S ETERNAL CERTAINTY IS NOT MAN'S
HELPLESS NECESSITY; OR THE OB-
JECTION THAT GOD'S FORE-
KNOWING AN ACT RENDERS
IT UNAVOIDABLE, PROVED
FALSE.**

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BY REV. T. WILLISTON, M. A.

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It was unfortunate that for want of room in the last number of the *Microcosm*, I could not there finish my answer to the objection, so persistently urged, that if with certainty God always foreknew just how all actors would conduct, said actors could not possibly act otherwise, and free agency is annihilated. This objection is proved untenable, in at least four distinct ways. (1) The Bible everywhere represents men as choosers, responsible for what they do; while it also represents God as foreseeing, appointing, and directing their various steps and doings. "Man's goings are of the Lord," says Solomon. "It is not in man that walketh to direct his steps," writes Jeremiah. "I girded thee, though thou hast not known Me," says God of Cyrus, the Persian, long before Cyrus was born. And Peter affirms that what Christ's enemies did with wicked hands was done in accordance with "the determinate counsel and foreknowledge of God." Now if, as is certain, the Scriptures represent men as answerable for the very deeds that were divinely foreseen and predetermined, then the objection I am considering is proved fallacious. (2) It is also proved fallacious by the fact that individuals have, in various instances, experienced compunction and felt self-condemned for acts which God not only foreknew, but which the actors were forewarned of Him that they would do. It is undeniable that Judas' treachery and Peter's thrice repeated lie were foreknown events and certain to occur, and it is equally undeniable that the two men had those stings of conscience and that overwhelming sense of guilt which none but unfettered free agents can experience. And since those men were consciously free in doing what it was previously certain that they would do, it inevitably follows that foreseen or predetermined acts are not forced, but voluntary acts, and that God's certainty is not man's unavoidable necessity. (3) The objection in question ignores the wide distinction there is between a moral and a physical impossibility. When it affirms, for example, that if Judas' betrayal of Christ was eternally certain he "could by no possibility" avoid betraying Him, it forgets that there are *can not* which, being nothing but *will not*s, or impossibilities of man's own creating, God regards as excuseless, and for which moral can-nots He holds men responsible.* When we say of a rebellious child that he could be dutiful *if he had a mind to be*, do we speak improperly? If some one should say, "that ugly boy *can't* be a good and obedient boy," would we from that moment cease to blame him for being

ugly, and simply pity him for his inability to be good? We do not mistake then, when we say that there was no other could not in Judas' case than a simple unwillingness of heart; and for that kind of inability we never hold men excusable, neither does God. (4) If, as this objection supposes, the foreseen certainty of a bad act's being performed would render the act a forced, irresponsible, and blameless act, then a good act or a good actor would cease to be good, or to have any moral character; provided it was absolutely certain, in advance, that there would be such an actor and such an act. Since, therefore, God has made it absolutely certain that the "elect angels" will forever retain the very character that He gave them when created—and since, if this objection is well founded, these angels cannot possibly help being what it was eternally certain that they would be—they are not free agents, have no moral excellence, and are worthy of no praise! Had they only been left to form their own character instead of having God to form it, and had He not resolved to keep them from falling, we could pronounce them holy and praiseworthy; but what goodness can there be in creatures whose character was given them, and who by a foreseen and eternal certainty are forced to be just what they are.

Notice now the confession which the Bible forces those persons to make who contend that a foreseen certainty annihilates free agency. It compels them to confess that some of the acts of rational agents were foreordained and rendered certain to occur. Well, how do they reconcile this acknowledged fact with the doctrine they so firmly cling to? Will you believe it, they maintain that in all such cases the acts performed "do not involve moral character," and that for the time being the actors cease to be free and responsible agents? "Where God foresees an event," says one of these mistaken reasoners, "He always determines to render it necessary, and to *suspend the moral agency and accountableness* of the creature concerned in it!" Another says that "in the kingdom of God's providences He has a specific plan, in accomplishing which He frequently uses men as instruments, and *constrains them by overpowering their free will* to do certain things; and the fulfillment of prophecy has been brought about in this way!" In these quotations we have the astounding doctrine, that in fulfilling prophecy, and executing His specific plan, God has occasion to have some acts performed that *would be wicked if the actors were free to choose*; but to prevent the actors in these cases from incurring responsibility and guilt, God temporarily suspends their freedom of will and their accountability! It is concluded by these reasoners (?) that in most of their doings men are choosers, and are therefore accountable; but "when God *foresees* an event," or has some fixed purpose to accomplish by man's agency, He kindly relieves man of all responsibility by converting him for the time being into a thinking machine!

To me so absurd a hypothesis as this, seems hardly worthy of any opposing argument; yet, as it is put forth with an air of confidence, as if unanswerable, we will examine it. Where, in the first place, do the authors of this subterfuge—for it merits no better name—obtain

their license for affirming that *only a part* of men's doings are divinely foreknown, or for affirming that in those acts of men which are foreknown the actors are rendered God's involuntary and irresponsible instruments? What right have they, without any warrant from the Bible, or from common sense either, to assume that in some of their conduct men are responsible choosers, and in some nothing but helpless machines? To say nothing of its being wholly unsupported by Scripture, can anything be more irrational than this hypothesis? Has it not the aspect of a man-invented prop, fabricated for the express purpose of sustaining the doctrine that predestination and free agency are irreconcilable?

Observe now, in the second place, what a convenient way of escape from compunction and from all accountableness wrong doers are furnished with in the hypothesis we are examining. If it be true that in fulfilling prophecy God not only uses men as instruments," but "*constrains them to do certain things by overpowering their free-will,*" a heart-cheering salvo is herein provided for all wicked doers. How consoling it would have been to Joseph's brethren to know, that in their treatment of that brother they were instrumental in fulfilling a prediction long before made to Abraham, and that, as their free will was "in that instance overpowered," they were entirely guiltless! How mistaken those conscience stricken men were when they said, one to another, "We are verily guilty concerning our brother," and what a pity it was that they had not then learned what is now made so clear and so soothing! And since Christ's dying as a malefactor was a foretold and fore-determined event, and since the various actors in that tragedy are spoken of as having done what God designed they should, how mistaken Peter must have been when he charged them with having slain Christ with "wicked hands!" Had Christ's crucifixers only known that "where God foresees an event, He always determines to . . . suspend the moral agency and accountableness of the creature concerned in it," Peter's charge and his pentecostal sermon would not have caused them to be "pricked in their heart;" nor would they, in their compunction have cried out, "Men and brethren what shall we do?"

Laying irony wholly aside, it may safely be affirmed that if this hypothesis is tenable, all grades of wicked doers—such as "steal, murder, commit adultery, swear falsely," &c.—might, as Jeremiah says, "come and stand before the Lord" and say, "We are delivered to do all these abominations." Only convince the wicked that for such of their deeds as God foresaw or purposed they are not accountable, and they will at once jump to the conclusion that they are accountable for nothing. Much as unregenerated men dislike predestination, no doctrine of the Bible will please them so well, or be so eagerly embraced, if it is only true, as this unscriptural hypothesis claims, that *in some of their conduct they are not free and accountable.*

To the opposers of foreordination I would respectfully say—Better, far better, deny that God has from the beginning foreseen or purposed anything than admit, as you do, that some

of men's doings "are infallibly foreknown," but that these foreknown acts of men "do not involve moral character," but are sinless because not free. Indeed, gentlemen, the hypothesis you uphold not only removes restraints and presents the wicked with an almost unlimited license to transgress, but its ultimate and legitimate sequence is, that there is in reality no such thing as sin or as human accountableness, or even as everlasting punishment! You have only to render it indisputably certain that in fulfilling His designs God has, in a single instance, despoiled an actor of his freedom, and rendered an act blameless that would otherwise have been sinful, and I see not why all wrong doers, human or angelic, may not rightfully rise up and say: "Will a just and impartial God be so unreasonable as to do this in one instance or for one wrong doer, and not for all? No, no; equity itself will forbid. And since it is ascertained that, in fulfilling prophecy and executing His 'specific plan,' God 'overpowers the free will' of His creatures and renders them irresponsible, we rejoice with joy unspeakable. We are glad that 'known unto God are all His works from the beginning of the world,' and that He has an eternal, all-embracing purpose; for we see now that, in executing that purpose He frees His creatures from all responsibility!" Believe me, gentlemen, if you can but *prove* that God has ever suspended or impaired an actor's freedom and accountableness in the doing of a wrong act, you will have established a proposition that wicked men and wicked angels will glory and rejoice in. Render that proposition indisputably true, and you will have created some comfort in the prison of despair; yea more, you will, in effect, have unbarred that prison and set its inmates free!

In bringing to a close my answer to the chief objection that is urged against "absolute pre-science,"—namely, that it is not reconcilable with free agency,—I have but a word or two more to offer. My excuse for devoting so much space to this one objection is, that it is and ever has been the leading objection to predestination; and if this can be proved fallacious, the enemy's main gun will have been spiked, and his smaller fire arms will the more easily be silenced. I am heartily glad that my antagonists are frank enough to confess that some events and some actions of men "are infallibly foreknown." What a pity it is that, in order to reconcile this with their grand objection to predestination, they have to resort to so miserable an evasion as this: that in all such cases God "overpowers the free will" of the actors, or "suspends their accountableness." I hope I have convinced my readers that this hypothesis is not only an irrational and utterly untenable one, but one that is demoralizing and dangerous in its tendency. I hope, too, that in this and the preceding article, I have been enabled to make it plain, that while God's foresight of men and their acts is absolutely unlimited, His foreknowing how they will act has no compulsory influence on them, but leaves them wholly unfettered. In short, God was never "nescient of future contingencies," and yet man is in the fullest sense a free and accountable agent. Other objections to predestination I propose to examine in succeeding articles.

AN INGENIOUS THEORY.

We print the following adroit method, suggested by our correspondent Mr. Clark, for reconciling the apparent contradictions in the arguments of some of our contributors on God's fore-knowledge, man's freedom of choice, &c. We confess we have not seen anything of a religio-metaphysical and philosophical character more ingeniously shaped to surmount difficulties than this:—

FOREKNOWLEDGE AND FOREORDINATION.

BY W. H. CLARK.

Mr. Editor.—Some little time ago one of your correspondents, contributed one or two articles for your Magazine, in which he was discussing God's attributes; and in which he seemed to think that unless he, in some way, got rid of God's foreknowledge of events involving sin, God would be responsible for man's sin and ruin. To so get rid of such foreknowledge on the part of God, he asserted that omnipotence may be so great that God can refuse to know of whatever event He may choose. I cannot agree with your correspondent in this matter; as this seems to me to be exalting one attribute of God at the expense of another, which to my mind is absurd. God being perfect, all His attributes must be perfect also.

Another of your correspondents takes issue with the former on this point, but I think goes to the other extreme. He holds that God must not only foreknow an event involving sin, but holds that the fact of sin existing is a part of God's original plan; so that if some should sin and be lost, it will cause those who are saved to be the happier and to give God the greater honor and glory. I cannot agree with this correspondent, either; for I cannot conceive how God can ordain or issue a mandate for sin to exist, and as a consequence cause some of His creatures to commit sin, and yet not be responsible in some way for such sin, which we all believe to be unscriptural.

I wish to give my views upon these subjects, and see whether I can throw any light on them by way of an attempted reconciliation.

In the first place, I hold that God in one sense foreordained and foreknew all events that have ever taken place, or that will take place in the future; but my view of foreordination is different from that of a great many others. I believe, in the first place, that God made laws to govern all things; or in other words, that He foreordained and established these laws, and upon the occurrence of any event, in accordance with these laws, then, as a consequence, and in that sense, the event was foreordained by Him. For instance: I do not think that from all eternity God issued a decree that at a certain specified period in the history of the universe a specified man should be born, that he should live a specified life, and at a specified time he should be walking past a specified house from the chimney of which a brick should fall and kill him. But I hold that God ordained certain laws; as a consequence of some of them the man was born, as a consequence of others the brick was loosened from the chimney and fell. If that man, in the exercise of his own free will or from other reasons should be at that spot when the brick falls, as a consequence of other laws, he will be killed; and as each event follows its own laws, each one when it is accomplished has been thus foreordained by God as the consequence of the law.

But the difficulty now arises: If this be so, how can God have foreknown that these events would really take place when they were merely controlled by His laws, and when other circumstances—

man's violation, &c.—might have modified the succession of the events?

I will now have to resort to what seems to be a paradox, viz., that I do not believe that God either *foreordains* or *foreknows any event*, which I will now undertake to explain. And to illustrate my meaning, I will have to take unlimited *space* as conveying the nearest approach to our conceptions of eternity.

Suppose, for example, that all matter was blotted out of existence with the exception of one person, who by some means had given to him the power of travelling with incredible speed. This person now travels at the rate of a million miles per minute for a million years. Where does he find himself at the end of that time? As far as space is concerned, he finds himself precisely where he started—that is, in the center of space; just as much space being before, behind, below, and above him as there was when he started on his journey. Should he repeat this journey in any direction, or in all directions one after the other, he could not change the result. Now, I think that is just God's position as regards eternity. He is in the center of duration, so to speak, all the time; and if an event has happened millions of years ago, as we count years, or should it happen millions of years hence, in either case it has happened at the center of eternity; and as that is where God constantly is, therefore, either event has happened in His perfect wisdom, and to Him *just now*. So that though in man's finite ideas, the events are separated by such inconceivable intervals, yet to God's infinite mind there is no interval at all, but an eternal *now*.

He is continually controlling and carrying out His laws. To man's mind he foreordains and foreknows. To His own mind He neither foreordains nor foreknows, but simply ordains and knows in *His* own, absolutely, always present *now*.

ST. STEPHENS, N. B.

LAWS OF MIND.—No. VIII.

BY REV. J. W. ROBERTS.

After these several pauses to meet the earnest requests of others for light on particular phases of the subject under treatment, a return to the contemplation of the main theme seems to demand a restatement of some of the underlying principles which form the only true basis of all research after truth in this field of investigation, that the reader may have them fresh in mind while pursuing the thread of the argument:

1. *Matter is inert, helpless, and of itself has no potency, activity or energy.*
2. *Matter, as such, has no life.*
3. *Matter possesses no intelligence.*
4. *What matter does not now possess, it never did or can possess.*
5. *No thing, principle, power, force or energy in Nature can impart to any other thing, principle, power, force or energy that which it does not itself possess.*
6. *All development and improvement of whatever kind must proceed from the higher to the lower, and not from the lower to the higher. In other words, that which has must impart to that which has not; and not that which has nothing, bestow upon that which also has nothing.*
7. *The bestowal of any endowment whatever upon anything whatever, which neither the bestower nor the recipient possesses would be to create something out of nothing—a thing which science utterly repudiates.*

8. *All potency, be its character what it may, in its origin must proceed from the superior to the inferior, and not vice versa—the greater contains the less, but the less cannot contain the greater.*

9. *Matter has neither life nor intelligence, and therefore cannot impart these qualities.*

These are axiomatic principles, and apply to all that is embraced in the universal empire of Nature—material and immaterial, tangible and intangible; and any system of science and philosophy which loses sight of them, or teaches contrary to them, must come to naught, because it is necessarily erroneous.

It follows that any development from the lower to the higher which requires the impartation of any new or added quality, power, potency, or whatever else it may be termed, even in the most infinitesimal degree, is an absolute impossibility.

Fundamental principles must never be bent or tortured to meet the requirements of a theory, but all theories must conform to fundamental principles and truths. Bearing this in mind will save many an able man from falling into error. These principles, as already stated, embrace in their comprehensive grasp everything which has an existence in the vast domain of Nature—including mind, substance and matter—though some of them are applicable only to matter; and their careful study, with a fair comprehension of their outreach and all-pervading presence, potency and limitations, will save the studious thinker from being led astray by false theories.

The writer and reader are now entering the arena of mind, having approached the confines of its enchanted realm by steady steps on the immovable pavement of truth; and while the development of the laws which govern this domain of intelligence may not always be susceptible of axiomatic demonstration, yet it is hoped most of them will be shown in a sufficiently clear light to be understood.

Having seen that neither matter nor substance can impart intelligence, because of their own destitution of this property; and as mind cannot exist without some degree of intelligence, however small it may be, it becomes self-evident that we must look elsewhere for the origin of mind. It is also self-evident that the origin or source of mind must be greater than mind itself, as we find it in man and the lower animals. That it did not originate itself, is as certain as that it was not produced by something less than itself; for every finite thing must have an origin outside of itself. No creature can be self-existing.

Mind is a verity; it is a creature; it is finite; it must, therefore, have an origin or cause. That cause must be adequate to produce it with all its powers, capacities and possibilities. That cause, then, must be greater than all these, or it could not have originated or imparted them.

As no creature of which the human mind has any knowledge, or can form any conception, when properly developed and enlightened, is adequate to the production of such a wonderful structure as the mind, it follows as a necessary conclusion, from all the foregoing premises, and in the very nature of things, that

mind is the product or offspring of a great supreme and unoriginated Cause or Source.

If it be objected that such a Being is beyond the reach of scientific investigation, incomprehensible and therefore not to be conceded as existing, it may be replied that there are a multitude of things beyond the reach of science which are conceded *facts*, whose existence we are compelled to admit, while we are confessedly unable to account for them, in themselves, or for the phenomena which attend them. Inability to understand or explain a fact, is no evidence or argument against the existence of the fact itself. We really know but little of the vast multitude of facts which environ us on every side with their impenetrable secrets that elude the most diligent and laborious research. He is a blind bigot who proposes to believe nothing, accept nothing, which he does not understand. The very first thing such a person would be compelled to reject, under this ruling of folly, would be *himself*; for no man has ever yet been able to answer the questions: "Whence am I? What am I? Whither go I?" Such self-rejection would probably be very mortifying to inflated egotism and conceited vanity, but must be none the less compulsory because of these inseparable appendages of conceited wisdom. Science, as yet, has given us but a limited knowledge of the qualities of things that exist within and about us, while it has signally failed to prove to us the origin of anything.

The limited scope of our knowledge leads to endless speculations, most of which are profitless, and a great portion misleading. Science has cause for humiliation over her failures and mistakes, rather than for boasting over her circumscribed achievements. But her efforts should by no means be disparaged, but encouraged.

All truth is not found in mathematics, chemistry, and mechanics. Logic is probably as good a demonstrator of truth as are figures, angles, triangles and circles; and much can be learned outside the chemist's laboratory or the mechanic's kit of tools. Over all these aids in the field of investigation presides *intelligence*, which is greater than them all, without which they are entirely useless; and yet this intelligence that presides over these labors and appliances is incomprehensible to itself, and the problem of itself or its origin unsolvable by all these aids. But who is foolish enough to deny his own existence because it is a profound mystery? Let us illustrate:

What mathematician has developed the source of gravity, or given its circumference, diameter, height, depth or immensity? What chemist has analyzed it and given its component parts, or anything concerning its composition? What mechanic has laid his line and plummet upon it, or told its size and shape? What have all these combined done to throw light upon its origin, or give us any adequate conception of what it is? True; its effects are visible; they are tremendous. They have to be met and overcome, or utilized at every step in life; but what else do we know about this potential factor in the economy of the universe, after all the research of the ages? Absolutely nothing. Yet who would be foolish enough to deny the existence of gravity because it is

an unexplained and apparently an unknowable mystery? And what is true of this, is equally true of all the elementary forces of Nature. We know they exist by their effects; that is all. Our knowledge has not yet penetrated the outer shell which envelops the essence of any one of them. But the facts of their existence we accept without hesitation or doubt.

As in countless myriads of things we are compelled to accept as facts what we cannot fathom or comprehend, and of which we know little or nothing beyond the bare truth that they are certainties, it ill becomes us as rational beings to deny other facts whose effects are just as visible because we are unable to go beyond the effects and grapple with the cause. When the great unexplored universe lies before us, not one of whose primary mysteries has yet been explained after these centuries of effort, a degree of modesty should commend itself to us as far more befitting our want of knowledge, than a boastful spirit of arrogant assumption or illogical denial. "Wisdom is commended of all her children."

That mind exists, is a conceded fact. As already seen, it is not and cannot be the product of either matter or substance, or both. Hence, it is not subject to the laws of the one or the other. But, as law prevails everywhere and nothing is exempt from its reign, there must be laws which govern the operations of mind, the highest of all entities of Nature of which we have any intelligent apprehension.

As heretofore stated the great law of production in the universe is, that "like produces like." Mind must, therefore, be produced by mind; intelligence by intelligence. Every creature must have an origin above or higher than itself, as clearly set forth in the axioms already laid down. As a logical necessity there must be a source of existence above the creature or created things. To originate requires an originator. Every effect demands a cause. Hence, there *must be* a great *unoriginated cause*. That this Cause is incomprehensible, is far less a stumbling-block than that some of the effects—nearly all of them—are utterly beyond the grasp of finite conception. We reach this point on every hand and on all lines of investigation. The ultimate of all inquiry is, incomprehensibility; and he is most wise, philosophical, and scientific, who makes that ultimate the most reasonable and logical, and in accord with the truths and principles which are really known.

Again: Mind not being the product of either matter or substance, is not subject to the laws which govern them. Take thought as an illustration. It is not subject to gravity or any impediments to motion. It travels over hill and dale, mountain and plain, river and ocean, and experiences no obstructions, no hindrances to its onward flight. It penetrates all depths, and rises to all heights, with the same unimpeded facility; and in any and all places, requires no aid to locomotion. It cannot be confined in prison walls, nor made the slave of cruel masters. As an effect cannot be greater than the cause which produces it, thought cannot be greater than the mind that conceives or creates it; but the mind must be greater than the thought it produces and sends forth, and possess in a more eminent degree *all* the quali-

ties and possibilities which it bestows upon its creature. What a field for reflection is here opened! But at present it cannot be occupied. All things in their order.

It follows, from the foregoing, that mind is *immaterial*. It must, then, have an immaterial origin; hence, an immaterial Originator. It must also be governed by immaterial laws; though while "imprisoned in a house of clay" it may be, as any other prisoner, deprived of its native liberty, and compelled to do drudgery by reason of its environments.

Arrived at this point, and this paper having already reached the limit of one article for this magazine, consideration of our proper theme—*The Laws of Mind*—must be deferred until next month.

INDIVIDUALITY IN TONE.

BY REV. T. NIELD.

Tones have typic qualities. One type is produced by concussion, another by friction, another by rebound, and still another by atmospheric force. Each type includes variety. There is further, a difference in the same tones of the same kind of instrument by different makers, and even in the same tone as emitted from the same instrument by different players. This is what we call individuality in tone.

As we set forth in a former article, the mode of its discharge, *i. e.*, its vibrational number, is that which gives a tone its form or character as such. Therefore, we must look for individuality of mode in the emission of a tone to get a clew to that which gives the tone itself its individuality.

We will notice first, the typic differences in tone. In tones produced by concussion, as when we strike a bell, the communication of the energy is instantaneous and evokes an instantaneous response, which gives the tone a shock of startling sharpness.

In tones produced by friction the energy communicated, say to the string of a violin, is in a series of vibrational rebounds, which is a slower method of communicating generative energy than in concussion. Hence, the response can scarcely be with equal concentrateness; but brings the sound more swellingly upon the ear.

Other tones are produced by rebound—as in twanging the strings of a harp, guitar, &c. Here the energy, though communicated more suddenly than in the drawing of a bow across the string, is not with the directness of concussion. It is the tone of the bow and string emphasized, the emphasis comprising the individuality of the tone.

In tones produced by atmospheric force, the air in passing through a pipe or aperture produces friction and emissive tremulance in the material instrument, when the atmosphere conducts and so diffuses the discharged acousticity. Here the initial generative energy is less localized, as well as less direct, in point of contact with the emitting instrument. Hence its tone is more diffused in quality, and strikes the ear with less abrupt concussive force.

From the foregoing, we conclude that, since sound itself, as cognized, is a sensation produced upon the auditory nerve by acousticity

in motion, and variety of tone is as the variation in the vibrational number expressed in that motion; therefore, such variation as we have called attention to in the discharge of the same tone must result in such a corresponding variation in the sensation produced as will account for individuality in tone.

And now we come to search for the causes of these variations in tone.

1. Different substances have different degrees of density, which implies a diversity in the number of molecules to the square inch. The difference between the number of molecules partaking in the discharge of acousticity in a square inch of glass or bell-metal and that of wood, probably gives a sub-quality to the tone. The difference also in the degrees of spring-power of the molecules of different materials modifies the promptness, *i. e.*, the quickness or slowness of their response to the initial energy. Iron being a more rapid conductor of sound than wood, the response of its molecules must be more prompt than those of wood, which may account for that peculiar sharpness of tone already alluded to, so far as the sharpness may be termed merely a metallic peculiarity,—a sharpness that bears some resemblance to rise of pitch. While the rebound motion of the molecules is with greater velocity, the vibrations of the mass are the same in the different substances, hence the totality of effect is vibrational synchronism, or sameness of tone. The prime motion gives the tone its prime quality. This sub-motion gives the tone its sub-quality.

2. Form in the instrument gives the tone emissive and propulsive form; and this accounts for the individuality in the tones of different instruments of the same kind. For instance, Niccolò Amati of Cremona, and his disciple Jacob Steiner of Absam, a Tyrolese, both manufactured violins having slender, rounded, sweet silvery tones—the result of a small, round and long swell, and a neat outline. Stradivarius, having sought a more sonorous tone, did not make the arch of his violins so high as did the two former masters; but gave it a wider and flatter swell, by which the noblest concert tone was attained.

We infer that there must be harmonic proportions in the curves and swells, somewhat as there is in the vibrational number of two separate notes to produce harmony, or there will be a dislocated expression, a resonant discord, and that the form of tone which gives it individuality is governed by the curves and swells.

A thin, short string, touched lightly, vibrates oftener than a thick, long string, struck boldly with the bow. Hence, the tone is lifted correspondingly. So “a small, round and long swell” in the resonating part of the instrument makes the tones round, slender, silvery—by directing, and so moulding, the supplemental, resonating current of emitted acousticity in such a way that it would raise the pitch of the tone itself were it not that the emissive energy, as expressed through the string, is the vibrational determinant. As it is, the reflex, or rebounding energy, expressed in resonance, reveals its tendency in this its individuality of tone. The larger sweep caused by the wider, flatter, swell of the resonator gives the tones a billowy or sonorous quality.

3. Two players evoke the same tone from

the same instrument; and yet one is full of feeling, has a soul, the other being but a corpse of sound. The reason is, the spirit of the former player is in sympathy with the spirit of the music, and thrills the instrument with a nervous tremor, as if the fingers of his soul imparted spirituality to his touch—whose subtle power, reciprocated in the sound, moves other souls that are susceptible to the spiritual efflux. The latter player but performs a perfunctory part, and his performance lacks the breath of life.

The power to modify the individuality in tones is, as the power of thrilling with this spiritual afflatus the receptive instrument. Concussive tones are least susceptible to spirituality, since most remote in their dependence on the causal agent. They are produced and modified mechanically rather than spiritually. Stringed instruments possess most power of spiritual utterance. And the violin, perhaps, surpasses all the rest; because its tones are least mechanically formed, depending for their quality exclusively upon the agent. Hence, why the violin, above all other instruments, betrays the tyro or proclaims the master. A mule might kick music out of a bell, but it takes a man to draw it out of a violin. The capacity of the violin for spiritual expression is as the communicability of the player.

The human voice goes still beyond the violin in power of spiritual expression; because the spirit plays the instrument itself without an intermediate agency. The instrument is ready to reciprocate the throb or glow of all emotions, and express the same in spiritual shadings of a tone or tones. Hence, the infinite variety and the sublime transcendence of their individuality.

In conclusion. In writing these articles we have neither tried to exhaust our subject, nor yet our rhetoric. We have rather aimed at brevity, intelligibility and suggestiveness, hoping that we might move some Captain Carter to make experiments that should either support or overthrow what we have advanced.

DR. KAVANAUGH WELL SATISFIED.

BY B. T. KAVANAUGH, M. D., D. D.

In the December *Microcosm* the Editor in a few courteous and sarcastic remarks, alluding to my series of articles on “Electricity the Motor Power of the Solar System,” introduces his remarks by this caption: “Dr. Kavanaugh still *not* satisfied.” I take pleasure in assuring the astute editor, and his readers, that this is a very great mistake. In reviewing the whole ground occupied in my various articles, and then referring to the points of objection made by the editor only, and those objections only centering on the moon question, I have felt not merely satisfied with the results, but I congratulate myself on finding the essential parts of my theory to stand self-vindicated, as I believe, in the minds of a majority of the unprejudiced readers of *THE MICROCOSM*.

I am disposed to adopt this opinion from the fact that I have received letters from all parts of the country where *THE MICROCOSM* is read, not only indorsing the doctrines maintained, but tendering flattering congratulations and thanks for the service rendered.

Two thousand copies of my lectures had been circulated, in pamphlet form, before they appeared in an improved form in *THE MICROCOSM*; and added to this, in a free intercourse with the people and among the schools and colleges in the West where I have lectured, I have had satisfactory assurances that if the positions taken are not wholly indorsed, no one has taken it upon himself to disprove the electric theory advanced, and many have declared their inability to do so.

It is true the Editor of *THE MICROCOSM* has set up in opposition the old doctrine of the books, as everywhere taught, that "projection and gravitation" is the only basis upon which the heavenly bodies are propelled and regulated in their motions; and of course this is indorsed by his friend Rev. Prof. Goodenow, of Battle Creek, Iowa, and it is likely by hundreds of others whose training is confined to the text-books of the schools.

The same ground may be taken in regard to the Editor's pet theory in regard to the laws of sound. He has "*inverted*" a theory that comes in conflict with the wave-theory of sound; and but for the fact that the latter has gotten into the text-books, and is taught in the colleges, the independent thinkers of the country would adopt the substantial emission theory without difficulty. Prejudice of education stands in his way.

For myself, I never did believe in the "wave-theory" of sound or light; and I believe Dr. Hall to be correct in his position. But I feel assured that when his theory is adopted by the text-books and colleges, and is fully recognized as true science, the electric theory of astronomy will be there and welcome him in.

I have stated, above, that the substantial grounds on which my theory is based have never been fairly met or answered. As I have before observed (See July *Microcosm*), "I objected to the practice of asking questions and answering them in a one-sided issue, by which I am made to toil at the laboring oar with nothing to combat in turn." The contest should be fair on both sides. I have taken objections against the received gravitation-theory, which I consider unanswerable. They certainly are, as yet, unanswered; and until those positions are fairly met, we hold them tacitly acknowledged as true.

Now, to show the permanent ground on which I have declared myself well satisfied, I here append a summary of the points I have made which to this day stand unanswered:—

I. In my first article I have shown that the whole earth is a magnet, caused by a native negative magnetism of its own, vitalized by a current of positive electricity passing from the sun around it, which gives to it its diurnal motion; 2, That the earth is therefore polarized—only magnetized bodies being susceptible of polarity; 3, That the polarity of the earth gives rise to the interchange of currents in the ocean between the poles.

II. My second article shows that the polarity of the earth when revolving in its annual orbit, necessitates the inclination of its plane and the elliptic form of its orbit; for when at its Summer solstice the positive North pole being presented to the positive sun it is repelled six million miles further from the sun than when

it is at its Winter solstice, where the South pole is presented; and it is, therefore, attracted to the nearest point of its orbit.

III. In the third article I account for the force by which the earth is propelled forward in its orbit, and demonstrate that the centripetal and centrifugal forces claimed to cause this are false as seen by the action of the comet.

IV. The fourth article demonstrates that the antipodal tides of the ocean are produced by the attractive and repulsive forces of electricity exerted by the moon. When this article appeared the editor acknowledged that the gravitation theory must be modified before the antipodal tides could be accounted for; but failing to modify as proposed, he has, in a subsequent number, fallen back into the old theory of the books—that it is produced by the attraction of the sun and moon jerking the earth away from the waters on the opposite side!

V. and VI. In the fifth and sixth articles I gave an analytical view of the form and functions of the sun, with its resources and expenditures of light, heat, and electricity, in which the so-called "spots" on the sun are shown to be large caverns or apertures through which the sun receives ample supplies of static electricity, which being converted into the dynamic affords a perpetual current of light, heat, and electricity.

A day or two ago, in conversation with a learned gentleman, he informed me that at one of our best universities he was present, and, in conversation with the Professor of Astronomy, he was informed by him—that in his observations on the sun, with special regard to its spots—he discovered a current rushing forward into these apertures with cyclonic force as if to fill up a vacuum within. This, if true, clearly confirms the correctness of my views.

These articles also demonstrate, by the experiment of the sun-glass, the union of light, heat, and electricity in every ray of the sun, and also demonstrate the difference between positive and negative electricity in their source and action as seen in Nature.

VII. The seventh article shows the practical application of electric forces in the productive support and development of vegetable life.

VIII. This article was a reply to Dr. Hall's objections, in the November number of *THE MICROCOSM*, (1882).

IX and X. In these articles I treated of the Effects of Electricity on men and animals, in the circulation of the blood, and the office of the nerves, showing the relation between mind and matter.

XI. "Dr. Hall's Objections Again." In this number, we strove to convince the learned Doctor that Electricity can and does exert a "push and pull" power in Nature equal to all the demands of the planetary spheres. This Dr. Hall replied to in the same number, and hinged all things on a solution of the moon problem—announcing that my rejoinder thereto would appear in the first number of the third volume of *THE MICROCOSM*; consequently, I was debarred from making any new point in the then current volume.

XII. So "Number Twelve" concludes the consecutive series with a statement of the principles on which the whole is founded, and the expression of a willingness to submit its claim

of merit to the criticism of all independent and impartial minds. It was never intended to be submitted to any *one* umpire, whose verdict should be accepted as decisive for all. As stated in the introductory article, I hold myself alone responsible for the doctrines and principles set forth.

Here, then, in these twelve articles, my electric system of Astromony is sufficiently set forth to enable the honest and candid reader clearly to perceive that Electricity, by its attracting and repelling forces, forms the motor by which the bodies of the Solar universe are propelled and kept in harmonious action; and this is shown, not only in general terms, but the specific mode of electric action is set forth in all its various parts.

Dr. Hall chooses to stigmatize this system as an "invention." The honest reader can clearly perceive that it cannot be an invention; for from the beginning, and throughout the whole system, we have taken up known forces of Nature, and tracing them along the lines of their legitimate action we have arrived at the results produced of their push and pull power in giving motion to and controlling the action of all the moving bodies in the solar system.

Now it is certain, that so far from inventing anything, we have been carefully following through the great machinery of Nature the footsteps of the Great Creator, reading His thoughts and designs in all its parts. Thus it is more a revelation from Nature's God, than an "invention" of any man.

In the whole course of this series, at various essential points, we have demonstrated that the laws of gravitation are wholly inadequate and inapplicable to produce the evolutions and to regulate the action of the Heavenly bodies; and it is remarkable that these positions taken have not called out a single objection to the statements made with regard to its insufficiency, except in relation to the moon. Now, as the moon and the laws of its action seem the only question in controversy, I propose for the present to suspend the discussion of the moon question to a future time, and consider the system in its relation to the sun and its primary planets confined to this limit. Up to this time there has been no attack made which I regard as of sufficient importance in any way to effect its general fundamental principles, and it is upon this ground that I declare myself well satisfied in regard to the substantial merits and permanency of my theory as founded in truth.

Since writing the foregoing parts of this article, I have found in the *American Cyclopaedia*, Volume XI, page 18, the full acknowledgement of the magnetic character of the sun and of the earth, showing most clearly that the latter is controlled in its action by the electric force of the former. This article was prepared by Prof. Joseph Henry, LL. D., of the Smithsonian Institute. This Institute, in the United States, is regarded as of the highest scientific authority. As my theory is based on the electric character of the sun and the magnetism of the earth, I am the better satisfied that its fundamental principles should be indorsed by such high authority.

MT. STERLING, KY.

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THE "LOCUST ARGUMENT" SUPPLEMENTED.

BY CAPT. R. KELSO CARTER.

The famous "Locust Argument" of the "Problem of Human Life," can not well be improved, but a valuable corollary of that demonstration has presented itself to my mind. A great many persons are disposed to laugh at the idea of filling four cubic miles of air with human ear-drums, or they are ready to suggest that, if the air was so occupied, the sound made by the insect would manifestly not travel anything like so far, would, in fact, be heard only by a few ears, and hence that the amount of matter moved by the locust would not be so appallingly absurd after all. We will grant all this unflinchingly. But now let us consider the *actual facts* in the case:

1. A locust has often been heard at a distance of one mile. This is the first fact. Were the creature one mile from the earth, we could claim eight cubic miles as the volume of air within which the sound could be heard. But as the locust is always upon the earth we are content with the plain fact that the sound is audible one mile in any horizontal direction, and one mile in altitude. This gives a half cube, or a prism of air containing four cubic miles. Of course the upper corners or edges of this prism are more than a mile from the centre; but we presume that no one can question the small addition, if the air be still and the day quiet. The fact then stands, that the locust frequently produces a sound which is audible throughout four cubic miles of air.

2. The second fact is that, *according to the wave-theory*, every particle of this entire four cubic miles of atmosphere is absolutely and positively forced to make a "small excursion to and fro;" starting from absolute rest, moving forward, stopping, or coming again to rest, starting again, etc.; of course, this is claimed as the very definition of wave-motion.

3. The third fact is, that this motion to and fro of the whole four cubic miles of air is caused *solely by the sound produced by the locust*. If anybody wishes to assassinate the wave-theory, let him venture to question this fact. Lest anyone should be so reckless, we ask: If the locust ceases his movements will the sound and the waves of air continue? If he begins again, will the waves begin? Is it not then absolutely axiomatic that he causes the motion, whatever it may be? Prof. Tyndall says that the whole office of the tuning-fork is to carve the air into these "condensations and rarefactions" constituting sonorous waves.

4. The fourth fact is, that four cubic miles of atmosphere *actually weighs* 24,000,000 tons, in round numbers. (Air weighs .08125 lbs. to the cubic foot. Use 2,000 lbs. to the ton.)

The first, third and fourth facts can not possibly be questioned for a moment; except to say of the third,—*if there be such motion*. We therefore present the wave-theorists the two horns of the dilemma. Either it is true that, when a locust scrapes its wings, it actually moves 24,000,000 tons of matter, or else there is no motion given to the air at all; in which case the wave-theory vanishes into smoke. Which horn will they accept? There is no theory here; no supposition of impossible

physical conditions, however lawful such may be in theory, but a plain presentation of the undeniable facts, that are frequently observed. What can be done with them?

There is one specious answer which will be essayed against this demonstration, that we wish to kill in advance. The wave-theorist must admit the motion of the air, and he must also admit that the locust actually causes that motion, or else stultify himself and fly in the face of axiomatic truth. Granting these two invincible positions, however, he seeks to evade unconditional surrender by talking about the nature of the motion in the air particles. He says it is a "molecular motion," not a "mass motion;" and that the "excursion to and fro" of a single particle is exceedingly small, almost infinitesimal in fact. We will now proceed to show that such talk is the veriest moonshine. We have the 24,000,000 tons of matter; we have the locust, and we have the motion.

Now it is not of the slightest consequence what the extent of this motion may be. As the problem is in mechanics, let us consult the text books on the subject. In *Peck's Mechanics*, page 21, we read: "Forces are in equilibrium when they balance each other. If a system of forces in equilibrium be applied to a body, they will not change its state. * * * If a body be at rest, we conclude that the forces acting on it are in equilibrium." On page 42, we read: "The resultant of two parallel forces, acting in opposite directions, is parallel to both, in the direction of the greater, and its intensity is equal to the difference of the intensities of the given forces." In this case the two opposing forces are, the locust and the inertia of the air particles. As long as the air is at rest it is evident the forces are in equilibrium, or do not act at all. The very moment motion begins, one force must over-balance the other. It makes no difference how small the excess may be—"infinitesimal" if you please—it is an excess. That is, *the locust force becomes slightly greater than the inertia of the 24,000,000 tons of air.*

The question here arises, What does this inertia amount to? In other words, how much force is required to move 24,000,000 tons of air? Can we measure the resistance of the air? Most certainly we can. This resistance depends entirely upon the rate of the speed of motion. We are told that a hurricane, moving at the rate of 100 miles an hour, exerts a pressure of fifty pounds to the square foot. Now an air-wave moves at the rate of 1100 feet in one second, which gives the tremendous velocity of 750 miles an hour. It avails nothing to say that the motion of the air-wave extends through a small distance. The amount of initial pressure exerted on the square foot is the same, no matter whether the actual movement extends through the millionth of an inch or one million miles. But, "the atmospheric resistance increases as the square of the velocity" (Peck, p. 163); hence, for the resistance of the air offered to a moving force which strives to induce motion at the rate of 750 miles an hour, the following proportion:

$$100^2 : 750^2 :: 50 : 2812.5.$$

This means that the amount of pressure upon a square-foot of surface, exerted by air moving at the rate of 1100 feet a second, ac-

tually amounts to 2,800 pounds of positive pressure. Conversely, *any body, moving at this rate through or in the atmosphere, will experience a positive resistance from the air, amounting to 2,800 pounds to the square foot.* Certainly, this begins to look sulphurous for the wave-theory. Do not forget that the distance traversed by the air-wave or air particles is entirely immaterial. If the air moves at a given velocity it exerts a certain pressure, entirely irrespective of the distance through which it moves. Let any one deny this who can. Now the prism of air containing four cubic miles of atmosphere, has a cross section of two square miles. How many square feet in two square miles? Upwards of 56,000,000. Then as each square foot represents a resisting force of 2,800 pounds, we have a grand total resistance of 156,800,000,000 pounds, or 78,400,000 tons. In other words the actual mechanical resistance of four cubic miles of atmosphere, to such rapid motion at a rate of 1100 feet a second, amounts to the entire weight of nearly four millions of twenty-ton locomotives. If each locomotive is allowed to be sixty feet long, this string of engines would reach in a solid line nearly twice around the world.

It may be suggested that the locust occupies one small spot, and does not in anywise push upon a surface of two square miles at once. Granted. But if the locust moves the four cubic miles of air any certain distance, he must exert the same amount of force as would be needed to push the air confined in a tube, having a cross section of 1×2 miles, by means of a flat piston of the same dimensions. Imagine an immense flat tube, two miles wide and one mile high. Conceive a flat piston, free to move in this tube. Let the tube be two miles long and full of air. Now the work of the locust is the same as that required to move that piston the distance travelled by air in an air-wave, and at the same velocity—viz., 1,100 feet per second. Not to move it 1,100 feet, but at *that rate of motion*. But it may be objected that the locust does not move its legs at any such rate. Ah, indeed! of course he does not; but the wave-theory never discovered that. That is a fact which is fatal to the wave-theory, as has been most abundantly shown. Again, it may be asked, if four cubic miles of air only weighs 24,000,000 tons, how in the world can it offer a resistance of 78,000,000? Very easily. Resistance, arising from inertia, depends for its intensity solely upon the velocity of the opposing body or force. A single horse may easily start a loaded wagon at the rate of a few feet in a second, while a whole train of locomotives could not jerk it into a velocity of 1100 feet a second.

In the *Scientific American* for Nov. 10, 1883, there is an excellent article on "Perpetual Motion." The writer says: "But, *as nothing gives what it does not possess, the generating force cannot give the machine a greater amount of motion than that which it has itself.* So the whole question of perpetual motion in this case is reduced to the finding of a weight that is heavier than itself, or of an elastic force that is greater than itself—a proposition which is absurd." Had the writer ever heard from the wave-theorists? They could have furnished him with an elastic force which man-

ages to multiply itself a billion times over. Let us recapitulate the facts.

1. A locust can be heard throughout four cubic miles of air.

2. This volume of air is moved to and fro at a rate of 1100 feet a second.

3. The locust is the sole mechanical cause of this motion, if there be such motion.

4. This amount of air actually weighs 24,000,000 tons.

5. *It is of no consequence how far the air particles actually move.*

6. The amount of mechanical force exerted by the locust, must be equal to the total resistance of the air.

7. This total resistance, to be overcome every second, amounts to 78,400,000 tons.

8. "Nothing gives what it does not possess."

Now gentlemen of the other side, there is only one of the above eight facts or conclusions which can be assailed. That is the second. We are ready to attack that one; but we simply defy any man to touch one of the remaining seven.

PA. MIL. ACADEMY, CHESTER.

WEIGHTS AND MEASURES.

BY REV. J. C. WILHELM.

We adopt Prof. Graham's improved heading, lest by the use of the term "Metric," we should again unduly excite expectation, or apparently bring ourselves under obligation to perform "duty" which we do not intend to undertake.

We have read the article of Prof. Graham in the December number of the "Microcosm"; and although we looked at it only from the ordinary angle, and not "perpendicularly, horizontally and diagonally," still we think we see the old fault running through it. We admit that if a thorough and elaborate presentation of difficulties in the way of introducing a new system of weights and measures could be construed into a defense of the merits of the old system, then this is a better defense than the former article which we criticised. But if, as we think, these difficulties of introduction do not necessarily touch the question of the comparative merits of the systems under consideration, any more than the difficulty of introducing Christianity into Fueda argues the superiority of cannibalism, then we think all this able and elaborate effort must be stricken out as useless in the controversy.

We did not formerly, nor do we now—nor shall we until some more germane issue is reached—undertake to *prove* the superiority of the Metric System, but only to defend it against what seems to us to be attacks, based not on its real merits or demerits, but upon prejudice and false reasoning—serving no perceptible purpose, except the creation of additional prejudice against it, which is probably after all the greatest of all the difficulties to be met in the way of its introduction.

So far as we can see, all that we said before still stands unimpaired in its force, by anything that has been said in reply; although, of course, *any other system* upon a *decimal* basis, would equally meet the world's need, except that (to use the Professor's main argument),

the Metrical system is already, to some extent at least, "in vogue."

In discussing a question of this kind, we think we ought to look beyond nationalities, and even beyond the difficulties of introduction, except as between systems confessedly equal in merit *per se*. The inconvenience to a single generation, or even to two or three generations, ought not to weigh against the convenience of all future generations. It is a cosmopolitan question, and one whose interest runs through all time to come. Difficulties of introduction, therefore, do not touch the real merits of the case.

Neither do the Professor's remarks relating to the defects of the decimal system of notation. No doubt, a duodecimal system of notation, not only for tables of weights and measures, but for *all computations*, would be preferable to the decimal or Arabic system; and a *sexa-decimal* system would be perhaps still better than either, being successively divisible by halving down to a unit, and by evolution to 2. But these would involve infinitely greater difficulty of introduction than the metric notation, which is "in vogue" the world over. The task of introducing new characters up to 12 or 16, with its new multiplication table, would be Herculean indeed.

We are no Frenchman, as the Professor assumes; but what may be even worse we are, as our name indicates, at least half *Deutsche*, and the other half is divisible into Scotch and Irish. But we claim no advantage, and admit no disadvantage to the Metric system on that account. This reference to our supposed nationality ("Like all Frenchmen," he says) is in keeping with the Professor's prejudice against the Franco-Greek and Franco-Latin terms used in the Metric system. As we said in our former article, "if the nomenclature can be improved, by all means let it be improved." It is not essential. But let not petty prejudice in favor of one language over another, become an impediment in the way of the international and universal adaptation of it to the wants of humanity. In school-boy debates we have heard it urged that woman suffrage would involve the liability of woman to military duty, etc. The connection is about as apparent between woman suffrage and military duty, as between a decimal system of weights and measures, considered in its essential features, and Franco-Greek and Latin or Anglicised Greek and Latin, or long or short terms for the denominations of such weights and measures. Yet it seems undeniable that some correlation of terms corresponding to the correlation of values, is an important advantage. If the Professor can invent something in this line simpler and better than the French, we will forego all the advantage of the partial introduction already effected by that system, and we will cheerfully advocate the adoption of his. The Professor, notwithstanding our well meant endeavors to guard him against it, has fallen, at one point at least into his old "method." "If," says he, "streets or roads are sixty feet wide, or if two towns are twenty-two miles apart, it is not argument to inquire 'how comes it?' They are so." Yes; but if they are *not* so, what then? If they are twenty-two myriamètres apart, which they are every whit as

likely to be, we could just as easily say that, and just as easily understand it, when we had learned what it means, and when it had become "established" in use as a term of measurement. Of course, we should have to learn these new tables just as we had to learn the old; but then it would be much easier, and we ought to be willing to do it for the sake of posterity.

We still insist that a uniform ratio between one denomination and another of any table of weights and measures has a decided advantage over an irregular ratio—not only in the facility of computation, but also in the facility with which it is apprehended and kept in mind; and that both these operations are further facilitated by a correlation of names; and so long as the decimal system of notation is in use, by far the best ratio will be a decimal ratio. All these points the metric system has, while the English system has none of them. Those who hate the French can call it the "Arabic" system, if they like the Arabs better. Mathematicians are accustomed to reduce almost everything to decimals, cumbersome as the process may be with our present system, even to Solar and Lunar revolutions. The Metric system is largely in use in our own country in chemical analysis and scientific measurements, and that by voluntary choice, and in spite of the difficulty of the contemporaneous use of another system in common business.

Surely, then, it would be preferred when brought into universal use. Can there be any such expectation of a universal use of the English system? We have cast off a part of that system. Let us discard the rest of it, and we shall no more think of ever returning to it than we now think of returning to the use of pounds, shillings and pence.

We still insist that the physician, if he use the Metric system, will not be under the necessity of prescribing "*the one sixteen-thousand-two-hundred-and-fifty-fourth part of a litre*" instead of six minims or 'drops'." And we repeat that "the argument is just as good for the new system as for the old." "Drops," whether of water, tar or dough, can be expressed, either as to size or weight, just as accurately and just as cheaply, in terms of the new system as of the old; and so can "the length of a dead King's-arm," or the size or weight of a *piece of chalk*.

The Professor strikes us hard, when he says: "We are not advised to use French Money." No; (1.) Because we already have discarded the English System, and adopted a decimal one.

(2.) Neither was any one advised to use French *cloth, or iron, or wine*. It was the *system of weights and measures* we were talking about, and that wholly irrespective of its being French, Dutch, Chinese or Choctaw.

We fail to see that the Professor's facts are any harder, or his words any softer than our own. We have not used his name otherwise than to designate his views and methods of reasoning. Whatever he means, by his proposition to send us *a diagram of his jokes*, we are inclined to accept it—hoping that it will amuse us, or at least, that it will not hurt us.

PETERSBURG, PA.

SCIENTIFIC AND SCRIPTURAL SUBSTANTIATION.

BY PROF. G. R. HAND.

Substance, of which visibility and tangibility may be predicated, intrude themselves into our presence, and challenge the recognition of our senses, without the aid of science. But invisibility does not hide away from the keen searching eye of science; for scientific investigation recognizes material substances, both visible and invisible.

The presence of invisible matter is known through its phenomena—its forces, effects, combinations and aggregations. Indeed, all matter is invisible when reduced to its ultimate atoms; and it is only in combination or aggregation, that visibility results. Such invisible and imponderable substances—as heat, magnetism, electricity, &c.,—become subjects of cognition, only through their phenomena.

Science, admitting the truth of the nebular theory of planetary generation, sees the invisible matter spread far and wide, in the form of incandescent vapor, in unseen silence, awaiting the activities that shall usher it into visible recognition. But the eye of science beholds invisibility merging into visibility, as, by the attraction of aggregation, a nucleus is formed; and the accumulating mass, in spherical form and increasing proportions, is finally rolled out upon its orbit, a full grown planet—our mundane sphere—to run its annual rounds, and "Hum the wild eternal bass in Nature's Anthem." Thus, even to the eye of science, is visibility born of the aggregation of invisibility, and "The things that are seen, were not made of things that do appear," (Heb. xi: 3.)

Science, in its laboratory, with retort and crucible, and other transforming appliances, reduces the visible to the invisible, and the invisible again to the visible, to the satisfaction of the scientist; and that, too, without arrogating to itself any claim to the possession of miraculous power.

A familiar illustration is at hand. A lump of ice is a material substance, visible and tangible, and composed of the invisible elements of Oxygen and Hydrogen. Place the ice in a vessel over the fire, and at thirty-two degrees, it passes into the form of water, a visible and tangible substance, and containing the same elements, and in the same proportion as before, but now in the liquid form. Continue the heat to two hundred and twelve degrees, and another transformation presents you with a quantity of steam, occupying seventeen hundred times the space it did in the form of water, and still composed of the same elements of Hydrogen and Oxygen, and in the same proportion; but now invisible, except when condensing in the atmosphere. The transformation has now carried it through the solid, liquid, and gaseous forms; and it could be carried back through the same forms in reverse order, by condensation, and congelation, till your lump of ice would stand before you, with the same visibility, tangibility, solidity, and composition, with which it started.

But before this reduction, we have another transformation by analysis to make. Pass the steam through a heated metallic tube, and its

elements are decomposed, the Oxygen combining with the metal, and the Hydrogen, set free, passing out of the end of the tube, in the form of an invisible gas. By another mode of decomposing water, the Oxygen may also be obtained in the form of an invisible gas. Next, the chemist will take these two glasses, and with the Oxy-hydrogen burner, recombine them in the same proportions in which they exist in water; and the resultant combination will be water, which, if you please, can be solidified into a lump of ice with all the original properties and composition with which we started.

Scientific Substantialism, being now briefly sustained by the recognition of invisible material substances, we transfer the investigation into the realms of Scriptural Substantialism, and find corroborative evidence in the Scriptural recognition of invisible and immaterial substances, as real and living entities.

1. My first witness will be the inspired apostle Paul, who deposes thus: "Through faith we understand that the worlds were framed by the word of God, so that things which are seen were not made of things which do appear." (Heb. xi: 3.)

Here we have invisibility merging into visibility, or, if you please, the invisible nebulae merging into worlds at the command of God.

2. The same witness writes: "Knowing in yourselves, that you have in Heaven a better and an enduring substance." (Heb. x: 34.) This carries Substantialism into Heaven as an enduring entity, and living reality.

3. The Psalmist deposes: "Thine eyes did see my substance, yet being unperfect; and in thy book all my members were written, which in continuance were fashioned when as yet there was none of them." (Psalm cxxxix: 16.) Here, under the guidance of the all-seeing eye, material and immaterial, in regular process, are merging into man, the wonderful microcosm.

4. Solomon wrote: "Then shall the dust return to the earth as it was; and the spirit shall return unto God who gave it." (Ecc. xii: 7.) In this, the process is reversed; and the tabernacle, the body, dissolved, the tent taken down and the material mingling with material, and the immaterial substance, the spirit, returning to the spirit land.

5. Now witness the putting off of this tabernacle, the body: "Yea, I think it meet, as long as I am in this tabernacle, to stir you up by putting you in remembrance, knowing that shortly I must put off this my tabernacle, even as our Lord Jesus Christ hath showed me." (2 Pet i: 13, 14.) This recognises the immaterial substance, the spirit, dwelling in a material house and prospectively vacating the same.

6. But the reconstruction and rehabilitation of the tabernacle is thus described: "But if the spirit of Him that raised up Jesus from the dead dwell in you, He that raised up Christ from the dead shall also quicken your mortal bodies by His spirit that dwelleth in you." (Rom. viii: 11.) Beyond all peradventure the material and immaterial are here recognised, and the mortal and immortal placed in antithesis.

7. Finally, Paul places in antithetical counterpoise, the outward man and the inward man, the seen and the unseen, the temporal and

the eternal, thus: "But though our outward man perish, yet the inward man is renewed day by day * * * while we look not at the things that are seen, for the things that are seen are temporal; but the things which are not seen are eternal." (2 Cor. iv: 16-18.) Here the inward man, the spirit, the unseen, is declared to be eternal. Then, in the place of this clear apostolic decision, who dares to affirm that the spirit dies or is annihilated? Thus the truth of Scriptural or Spiritual Substantialism is sustained.

SACRAMENTO, CAL.

THE ORIGIN OF SIN.

BY. PROF. I. L. KEPHART, A. M.

"Sin exists by reason of the abuse of free will." "Sin is the transgression of the law," or rather, "the transgression of the law is sin." God, by creating free moral agents—beings capable of virtue—capable of appreciating and adoring His infinite goodness, wisdom and love, gave existence to those conditions which rendered it possible for sin to exist; and this He did, because it was impossible for Him to create beings capable of virtue without making them free to obey or disobey His wise, holy precepts, and because, in His infinite wisdom, He saw that it was far better to bring into existence beings capable of virtue, even at the risk of having sin introduced into the universe, than to have no such beings exist.

In creating free moral agents, God surely saw all the possibilities involved. He saw that it was possible for angels to fail to keep their first estate; He saw that it was possible for them to rebel against His authority, and become devils who would seek to induce others to join them in defying His authority; but it by no means follows that before creating the angels, He actually saw exactly the very individuals who afterward *did* rebel, and *did* fall, and by so doing actually *did* introduce sin into the universe. From the very nature of God—from the intense love He has for all His creatures, the infinite regard He has for all His laws, and His infinite abhorrence of sin, we must believe that, could He have foreseen before creating them, exactly which of them would rebel against His authority and introduce sin (that arch enemy of all good) into the universe, He would have refused to give existence to such. Either this, or it was impossible for the infinite God to create those angels that *did not* rebel, without creating those who *did* rebel. But this last view limits God as to the choice of whom He will and whom He will not create.

Some angels did rebel. Their first deliberate rebellion, in thought, introduced sin into God's universe. That He would gladly have prevented this, had it been possible, is certain from the very nature of things, as well as from the nature of sin and the nature of God Himself. Sin is the violation of God's laws—laws founded in infinite wisdom, goodness and justice, and in the best interests of God and all His created intelligence. Obedience to all their requirements is essential to the peace and happiness of all. In the very nature of things, the highest possible good to each and all, is only secured by the complete, cheerful obedience of each and

all to all the requirements of God's laws. To conclude otherwise is to brand God's laws with imperfection, to accuse Him of inefficiency or insincerity in enacting them; or to conclude that greater good can be secured by violating the laws which He has commanded all to obey, than could be secured by all obeying those laws. Hence how ridiculously false and preposterously absurd that theology which teaches that greater good is secured by some free agents for having sinned than could have been secured by their remaining loyal to God! Could God have foreseen *before creating*, exactly which of His free moral agents would violate law and be forever damned in case they were created, He would surely have refused to give existence to such, and, by so doing, have prevented the introduction of sin into the universe; but as He could not possibly foresee, as *certainities*, the volitions and acts which, by reason of actual free moral agency, were purely contingent, therefore it was not possible for Him to give existence to free moral agents and absolutely prevent the violation of His moral law, any more than it is possible for Him to make a grindstone to revolve both ways *at the same time*, without suspending some of the laws of matter which He has established.

Angels having rebelled and introduced sin into the universe, God proceeded to make man, a free moral agent, and place him in a state of probation. In doing so, He certainly knew it was possible for him to sin, persist in rebellion and be forever lost; and He may have known that it was highly probable many would do so. But that He would surely have refused to give existence, or would have called out of this world in their infancy those who actually do persist in sin and are finally lost, had He known beforehand that they would do so, we must conclude for the reasons above given. That He could not foreknow exactly who would persist in sin and be finally lost, is evident from the fact that such persisting in sin is the voluntary act of a free moral agent, and, consequently, purely a contingent matter until the free moral agent has decided his destiny by his violations; and how can omniscience foreknow *now*, as a certainty, that which is *now purely contingent*?

Although God did not and could not know, as a certainty, when He created man, that he would fall, yet the circumstances and conditions were such that He could and did anticipate his fall; and because, in His infinite wisdom, He saw that greater good would be brought about by creating man, even if he did fall, and even if some by persisting in sin were forever damned, than could possibly exist if man were not created, He proceeded to create him. But this, by no means, proves that greater glory comes to God and greater good to the universe, by man's sinning than if he had not sinned. Much as is the good, and great as is the glory which God brings out of the violence done to His righteous laws, a vastly greater amount would have been brought about had all ever rendered a willing, cheerful obedience to those laws.

Anticipating man's fall, infinite goodness also anticipated a remedy, or a plan by which to still extend to him an offer of salvation. This plan included the gift of His Son. At the time of creating man it was fully purposed in the

mind of God that, in case man, through being tempted, did fall, that He would give His Son to die to redeem him. Hence, in the mind of God, Christ was "a Lamb slain from the foundation of the world," conditionally—that is, in case His death became necessary to redeem our race. Had man never fallen, never needed a Saviour, Christ would not have died; but the fact that God the Father, and Christ the Son, had fully purposed to redeem man by His death, in case such redemption had become necessary, would be as distinctly revealed to all shining intelligence, as is the fact that Christ has actually died; and thereby as much actual glory and praise would have been ascribed to the Triune God, for His gracious purpose of love, as is now ascribed to Him, because Christ has actually died. Logic and reason constrain us to this conclusion, otherwise we would be compelled to conclude that Satan and his hosts have done more good by rebelling against their God than they could have done by continuing loyal to Him—a most absurd, preposterous conclusion.

Sin having been introduced into the world, as a matter of course, and in accordance with His wise, benevolent nature, God does so utilize it as to bring about the greatest possible good, *consistent with the existence of sin*; but that still greater good would not have been brought about had sin never had an existence, than is brought about in spite of its existence, is an absurdity that is simply astounding.

WOODERIDGE, CAL.

ELASTIC TRANSFER OF FORCE.

BY REV. PROF. S. B. GOODENOW.

We have found (Oct. and Jan. Nos.) that perfect elasticity *doubles* the force imparted from one mass to another; so that, if the masses are equal, the *whole* force goes from a striking body to the body-struck; leaving the former at rest. This is seen by experiment with two ivory balls, suspended so as just to touch; the one being drawn back and let fall, imparts all its force to the other and stops, while the other takes all the force, and goes off with the same motion as if it were the ball let drop.

Just what the first mass does to the second, that second will do to a third, and that third to a fourth, and so on indefinitely, provided the masses are all alike. Thus in the experiment with any number of ivory balls, the force of the ball let drop is imparted to the next ball, and thence to the next, and the next; each stopping because the whole force has passed from it, except the last, which retains the whole force imparted, and moves off as if it were the ball let drop.

This experiment fully and clearly shows, that when the last mass moves off, there is no moving force left in any of the preceding masses; and that, if the last mass be prevented from moving, so that the force re-acts to throw back the first striking mass, that re-action is a return of the force from the last mass *after* it had all gone there; and hence, an *interval of time* must elapse between the striking of a mass and any elastic re-action that can return upon it. This experiment also shows that elasticity is the only means for the full transfer of force

from one mass to another. And it is the awakening of this new force in the expenditure of original force, that disseminates and perpetuates the effect.

It is the elastic half of the action, that, by re-action, throws back the striking mass to rest, while throwing forward the struck mass with full motion away from it. The other half of the action, or the mere unelastic stroke, simply equalizes the velocity of both bodies, keeping them together at reduced speed, as if one enlarged body. This is seen in the above experiment, when clay balls are used instead of ivory. The elastic action has to be preceded by indentation, more or less; and it is the action forward, and re-action backward of that indentation, in restoring itself to the normal shape of the mass, that produces the elastic effect. Elasticity is, in fact, the tendency of a mass to prompt return from indentation.

Indentation without elastic return, is what occurs more or less in the striking of unelastic masses. A mass may be even liquid, or very much indented by a force applied, and yet not be elastic, or urgent to return to shape from that indentation. In that case, the motion is not fully thrown forward upon new mass, only half of it having reached even the next particle when the indentation is complete. And the force is thus left to push sidewise and around, filling the vacancy just caused, as the most yielding quarter restoring equilibrium.

But if a fluid be perfectly elastic, that is instantly restoring an indentation made in it, then the whole momentum is thus thrown rapidly forward from part to part of the fluid (as from ball to ball above), leaving no force behind to re-act into the vacancy, which is at once filled from the other way. The less (by reason of solidity) may be the amount of indentation and elastic rebound, as in the case of the ivory balls,—the less will be the movement of each ball or item of mass (since that movement is only the amount of indentation),—and the less will be the time occupied in transferring the force afar through all the items of mass, since that is only the time spent in indentation (the transfer through unindented solid mass being instantaneous.)

So that, the atmosphere (by reason of fluidity) receiving greater elastic indentation, (with little if any solid, unyielding portion,) occupies more time with more motion in transferring momentum, than do the ivory balls. And thus, *the less velocity* and motion an elastic mass or fluid gets from a given force, *the more rapidly* is that motion communicated to distant parts; the very opposite result to what some seem to suppose.

We thus learn, that (regarding the small equal portions of a fluid as if distinct masses, like the balls) when a momentum is given to any small portion of a continuous fluid, all whose parts are perfectly elastic, the whole of that momentum will be at once imparted to the portion next to it, and thence to the next, and the next; each portion coming to rest as it parts with all its momentum, and no re-action being able to return upon it to disturb it, till that momentum has passed on far away. At the same time, the vacancy left by the motion of the first portion, must cause a like momentum from behind in the same direction, propagated

to each portion backward also indefinitely.

Thus in a long close hall, with window sash at each end on a poise so as easily to jar, a door in the middle when moved very slightly will, almost on the instant, tip the sash in that direction with a like jar at both ends of the hall. And so, a to-and-fro motion of the door will send the sash backward and forward, with a rattling noise at each window. The door's slight motion is *imparted* successively to the particles of the intervening fluid medium, which particles successively stop in imparting that motion all to the next (preliminary to a return),—until the last particles shake the window-sash in correspondence with the door. This is the principle of the *air-telephone*, transferring motion and its effect from one end of a tube to the other.

Shove a piston into one end of a long tube, extending say twenty feet from the point where the piston stops. If it has been shoved one inch, that inch of air has been crowded against the whole twenty feet of air beyond; and to relieve the pressure one inch of air will come out at the other end of the tube, or will move that distance a like piston placed there (supposing no friction to be overcome.) And, meanwhile, every particle of air in the tube will have moved forward only one inch; though the effect, namely, the transfer of motion from the one piston to the other, will have reached the whole length of the tube in that same instant of time.

If the shoving of the piston has been two inches instead of one, (there being still the same twenty feet beyond its stopping-place,) it has required double force to shove it, and double force or intensity of motion is communicated all the way to the other end; but the *time* required so to communicate it, may be the same as before. That time depends on the *rapidity of transfer* carrying the effect from particle to particle, not upon the *velocity of motion* given to the particles. The *rate of transfer* is different for different kinds of medium, and is not here in discussion.

Now let the tube be dispensed with. Then the forward momentum imparted to a small portion of the fluid, will be transferred straight forward as before; only, as it comes in collision also obliquely with similar portions of the fluid on each side, they also will be set in motion, and their motion will also be straight forward in oblique direction. Thus will the motion at once spread in a fan-like form, reaching all parts of the fluid in that hemisphere. Meanwhile, the similar motion in the same direction created behind the first moving portion will have spread in the same way through the whole of the other hemisphere. This is illustrated by the fact, that the motion of a finger or other object to-and-fro in water, sends off waves not only straight forward, and backward, but circular in every direction.

This division of the force, and diversion of it to the sides, of course reduces its intensity in every direction, in proportion to the distance reached and the space filled, until the whole momentum is scattered and dissipated afar. If the center mass, whose forward action caused the whole result, immediately falls back, the same result reversed will follow. And thus, a sudden vibration given to any one small por-

tion of an elastic fluid, produces a tremor in all the surrounding fluid, which tremor gradually vanishes in the distance. And this tremor being in two hemispheres, they naturally affect each other where they meet and mingle, at the sides of the mass giving the first impulse; as is well shown in *THE MICROCOSM*, (Nov. p 111.)

The force producing the whole tremor, is that impulse which makes the first indentation—whether the slight dent in the first ivory ball, or the larger dent in the first portion of air, (that portion reaching to the point where no effect is yet produced when the dent is complete.) As this force is at once diffused in all directions of the hemisphere, its value at any point (as soon as it is evenly diffused) is decreased in proportion to the number of points at that distance; that is, in proportion to the square of the distance.

But as thus diffused abroad, it is only *the original force transferred in the lapse of time to other mass*, and so preserved by the law called *inertia* of motion and *conservation* of force. The original impulse effecting one indentation (of only the mass meanwhile affected,) is *all the force newly exerted in that time* at the center, (as in case of the ivory ball;) any motion at the same time beyond, being the mere *inertia* or *conservation* of *previous* force exerted.

Thus a very small expenditure of force at any center in a fluid, will leave the whole mass successively in a tremor for a considerable distance, by a *transfer* of the same conserved force, moment by moment. It is somewhat as a slight spring jostled will jostle in turn a great number of similar springs arranged in succession. After the first touch, the springs (or air-particles) go on to *jostle themselves*, in a sense; that is, by *their own* elastic force thus awakened and successively transferred. Thus, also, the overturn of a standing brick will lead in successive moments to the overturn of any number more, if suitably placed to conserve the whole force of the start without diffusion or waste.

Such *perpetuated* results of a little effort are familiar to all; and they give to men a lasting power, long after they are dead and gone. It will not do to mistake these after-potencies of Nature's ever-revolving wheel-work, as if they were all the instant simultaneous exertion of the little insect that merely starts the pendulum. We might as well say, that the infant that touched the electric key, at that moment exerted all those tons of energy, which thereupon tore the massive ledges of "Hell-Gate" into ruins.

I have thus given, without any special application to *sound* or other controverted subject, the simple laws of mechanics, as seen in the elastic action of solids and fluids. Let each one carefully study these laws, and make any needed application for himself.

BATTLE CREEK, IOWA.

SOMETHING OUT OF NOTHING.

BY REV. M. STONE, D. D.

It must be admitted that *THE MICROCOSM* does not believe that something could come out of nothing, and its Editor has decided to drop the discussion of the question without further argument, on either side; and yet allusions now and then crop out, adverse to the *creation* theory. It would seem that opinions

as old as human literature embodied in the religious thought of the most intelligent men of all the ages, should not be tabooed without a very full and free investigation; especially as the *creation* theory accounts for the existence of the material universe, and the denial gives us nothing in its place. The opponents of that theory, do not even declare for the Eternity of matter, nor intimate any origin of it.

The whole creation is a succession, a chain of links—and we cannot conceive of a chain without a first link, or without a cause; and unless a possible origin can be found for it without a creator, it is not wise to refuse the only conceivable account of it. It has been said that something out of nothing is unthinkable. Is not *self-creation*, and is not an *eternal succession* quite as unthinkable? The belief of the production of something out of nothing is the only possible account of the visible universe, unless we assume the absurdity of *eternal succession*, or *self-creation*. The rejection of the theory of creation inevitably involves the denial of the existence of God. It involves, also, the denial of several miracles in the Scriptures; indeed, it practically sets aside all the miracles. In the 18th Chapter of 1 Kings we have an account of a widow with a *little meal* and a *little oil*, enough for one little cake, that stayed not for a whole year that she, her son, and the prophet lived of it. Another widow in 2 Kings 4th Chapter, has one pot of oil increased so that it filled very many. The two miracles of the loaves and fishes in the New Testament were so increased they satisfied the hunger of 5000 men, besides the women and children in one instance and 4000 in another, leaving a greater amount of fragments than there was of the whole store at the beginning in each instance. The changing of water into wine at the marriage in Cana of Galilee, too, may be cited as another instance of the miraculous creation of matter, or we must reject all these miracles as lies; and indeed everything else in the Bible, for their credibility rests upon the same witness as all the rest of the Scriptures.

If there is any way to account for the increase of matter in all these instances let it be brought forward, and then let those who deny the *creation* theory suggest some possible origin for matter; and when they have disposed of its origin, let them try their hand at its adjustments and adaptations, and give it life—vegetable, and animal—if they can without a Creator.

DR. VAN DYKE'S BOOK.

We are pleased at the response our readers have made to our brief notice of "*Through The Prison to The Throne*," in the January *Microcosm*. We are receiving orders from various sections of the different States and territories, and as far as heard from all are pleased with the beautiful work. We will send it as proposed for \$1, or will send a copy as premium to those purchasing a copy of the *Problem of Human Life* (\$2), or to those sending us three subscriptions to *THE MICROCOSM* (\$3). We will do the same with the "*Death of Death*," by Col. Patton, which we noticed last month, and we hope to be able to record an equal sale after that notice has been well read.

WILFORD'S MICROCOSM.

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A. WILFORD HALL, Ph.D., Editor and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

PROF. GOODENOW ON ELASTIC PULSES.

REVIEWED BY THE EDITOR.

We are glad to have so able a scientist as Prof. Goodenow come to the aid of the wave-theory, even though he does not do it avowedly; but we are sorry to see in his elaborate article, on the "Elastic Transfer of Force," printed elsewhere, what we are compelled to consider as a very loose way of discussing critical matters of science. Indeed we see in that article what we regard as fundamental and very grave scientific errors, as we will now endeavor to show, which errors unquestionably must have resulted from a thorough education in the teachings of the erroneous text-books which so frequently prevent even great minds from the accurate sifting of difficult scientific problems. But for the professor's unwarranted misapprehension of facts, in his treatment of the elastic transfer of force, he would have been directly on our side of the sound question. His mistakes, as we propose to show, by following the text-books, are alone what causes his argument to lean so strongly toward the wave-theory.

Take, for example, the very first sentence in which he avers that "perfect elasticity *doubles the force* imparted, from one mass to another;" a statement as untrue as it is unreasonable. We have frequently insisted in these columns, and emphasized it in various ways, that elasticity is but a *property* of bodies and not a "force" in any sense whatever. This being true it can not add one grain to the mechanical force externally communicated to a body, much less can it "double" it. The property of elasticity merely permits a certain distribution of a given mechanical force, and in a certain way; or it permits the rapid transfer of this single force from particle to particle, or from mass to mass, which force, but for elasticity, would be immediately absorbed or used up, so to speak, in the two bodies striking each other. In our reply to Prof. Comstock last month we showed that the property of elasticity is no more a mechanical force, and no more adds to or increases a mechanical force communicated to a body, because it permits a certain kind or extent of motion as the result of such force, than is the property of *ductility*, *fusibility*, or *combustibility* a force because it permits certain effects by the proper application of external mechanical energy. How then can a scientist be warranted in such an expression as that "*elasticity doubles the force* imparted from one mass to another"?

The truth is Prof. Goodenow himself clearly

confirms our view by his illustration of the ivory balls which immediately follows. He there shows that it is the identical *single force* of the falling ball imparted to the mass or ball struck that is thus transferred to the second ball through the medium of elasticity, and consequently that there is no *doubling* of the force about it, and not even the generation or bringing into play of a single grain of additional force on account of such elastic property of the two masses. Look at his illustration, read it carefully, and then see how completely it proves our position and refutes his own :

"This is seen by the experiment with two ivory balls, suspended so as just to touch; the one being drawn back and let fall imparts *all its force* [not *doubles* its force] *to the other and stops*, while the other *takes all the force* [not *double* the force] *and goes off with the same motion* [not *double* the motion, as it should do with *double force*] *as if it were the ball let drop.*"

Hence there is no *doubling* of force in the premises, he himself being judge, and not even a grain of new force is added by elasticity, but merely a distribution or rapid transfer of the original force is permitted by this peculiar property of two striking bodies. So far from elasticity *doubling* the force imparted by the striking ball, Prof. Goodenow contradicts it in his last article, printed in the January Microcosm, at page 176. He there says :

"Whatever the swing and velocity of the ball let drop against the other ball at rest, that striking ball imparts *all its force and velocity* [not *double* its force and velocity], and comes to rest; while the struck ball takes up *the whole* and goes just as far as the other ball came, supposing no obstruction from the air." Again: "Perfect elasticity causes full impartation of the *whole force* [not "*doubles* the force"] to an equal mass struck, leaving the striking mass at rest; and the fact that it stops at once upon striking, is proof that elasticity has transferred *all its force.*"

Thus, in his former teaching as well as in the present article, he distinctly contradicts the idea that elasticity "*doubles* the force imparted from one mass to another," averring over and over that it only allows the transfer of the whole single "force and velocity" of the striking mass to the mass struck. Although this latter position, as regards the transfer of *motion* or *velocity*, is not correct, as we will soon show; yet it is the office of elasticity to permit the transfer of the entire force and a large portion of the original motion imparted, and thus cause extended motion to the struck mass instead of the force consuming itself, as before remarked, within the striking masses themselves—as in the case where they are perfectly inelastic. In such case, instead of the force

being converted largely into extended motion it ends in the molecular displacement of the two masses and their motion together.

But even with perfect elasticity, and in a perfect vacuum, there is and must be a limit to the motion produced in matter by a given mechanical force—owing to the fact that only a certain amount of *static inertia* can be overcome, by a certain expenditure of mechanical force, however elastic the matter acted upon. And here occurs another serious, if not inexcusable, error in Prof. Goodenow's reasoning. He really asserts and teaches that the motion produced upon perfectly elastic bodies by a given mechanical force is unlimited; yes, *unlimited* (for no other purpose as we can conceive, and as the sequel will show, than indirectly at least to aid wave-theorists in their desperate difficulty with our locust-problem), and that the increase of mass or number of masses, and of consequent inertia to be overcome, have nothing to do with such unlimited transfer of force! Are we misrepresenting the Professor's views in this most damaging statement? Not in the least. Here are his own unmistakable words:

"Just what the first mass does to the second, that second does to the third, and that third to a fourth, and so on indefinitely provided the masses are all alike. Thus in the experiment, with any number of ivory balls, the force of the ball let drop is imparted to the next ball, and thence to the next, and the next; each stopping because the *whole force* has passed from it, except the last, which retains the whole force imparted and moves off as if it were the ball let drop."

That is to say, the *inertia* of the different balls overcome in this operation, is counted as absolutely nothing; the resistance of the air, only, being allowed for. A graver scientific error was never inculcated. We admit if there was no inertia to be overcome in each particular ball changing from a state of rest to a state of motion, that the Professor would be correct. But this inertia of rest is an independent factor of resistance; in overcoming which, a certain amount of the original mechanical force is neutralized for each ball moved. It is surprising that such a self-evident truth as this should have been overlooked by so careful an investigator as our contributor, and that he should teach that "*the whole force*" will pass through a row of balls extended "*indefinitely*,"—that is, any distance, a mile, or ten miles,—causing the last ball to move off "*as if it were the ball let drop.*" Now we simply assert that this is false science, and as ridiculous as it is untrue. To demonstrate it, we have proved by careful experiments which we

have conducted, that it is as plainly impossible in practice, as it appears to be in theory. But this manifest error in statement of facts is just what the wave-theorist needs, as it works directly for the little locust, to prove its ability to kick four cubic miles of air into motion by its ability to displace one cubic inch in contact with its body—since elasticity, as he claims, transfers such motion *indefinitely* or to “any number” of cubic inches. But we will soon see its impossibility; as each air-particle is the same precisely as an infinitesimal ivory ball of the same weight, having an equal amount of inertia to be overcome, making 20,000,000 tons of such elastic air-particles “all alike,” just as difficult to put into motion as would be 20,000,000 tons of suspended ivory balls, as distinctly admitted by Prof. Comstock last month. Let us, therefore, experimentally test and expose this teaching about ivory balls, getting at the absolute facts in the case in defiance of all text-books on the subject, and see where the matter leads us.

Even if we take only two suspended balls, letting one drop against the other at rest, the struck ball will not travel, by accurate measurement, as far as will the ball let drop if unimpeded, though both meet with the same resistance from the air; since a small portion of the striking force must necessarily be deducted for overcoming the inertia of the struck ball, which inertia is simply the downward force of gravity that has thus to be neutralized. Prof. Goodenow says, positively, that the struck ball will travel as far as the other ball would have gone, but he lies under a mistake. The difference in travel, however, is so little in its first swing, where only two balls are employed, that to the observation of the average experimenter, blinded somewhat by the text-books and not going to the trouble of minute measurement, it would be apt to be overlooked, especially should he lack the critical habit of going down below the surface of things to recognize the underlying necessities of the elementary laws of physics. If a man, however, will thus critically look at the principle of science here involved, he will at once see how mistaken must be Prof. Goodenow. He will see that each ball added to the suspended row must deduct something from the motion of the last ball that takes up the force, since each added ball is bodily displaced to the extent of its elastic indentation, and thus consumes some of the original force in overcoming its static inertia; until finally balls enough can be added, without extending the row many feet, to consume the entire force imparted by the striking ball, thus transmitting *no separate motion whatever to the last ball in the*

row. How plain and self-evident! One needs only to watch the action of the two suspended balls with one let drop against the other at rest, as Prof. Goodenow describes it, to see plainly his error. If the struck ball really travels as far as the striking ball would have gone, then of course in returning and striking the first ball again the latter should be sent the same distance, and so on, back and forth, the two balls alternately striking each other and transferring their “whole force and velocity,” as Prof. Goodenow avers, should keep up “indefinitely” the full motion the first ball would have had. This is the doctrine of the text-books and of Prof. Goodenow; but the facts are entirely different, since the two balls after beginning to strike will lose motion rapidly and come to rest or *entirely cease striking each other in about twenty seconds*; whereas the single ball, let drop through the same distance unimpeded, will continue to swing through fully one third of its first motion for *more than one hundred and twenty seconds, or more than six times as long!* This is simple, indisputable fact, as experiment shows, and as any one can see by trying it, and there is no getting away from it. What now has caused all this loss of motion in the two balls striking each other, and transferring their “whole force,” each stroke, which Prof. Goodenow declares causes no loss at all of the original motion? We answer, it is caused by the necessity of continuously overcoming the *static inertia* or gravity of the struck ball as each of the two balls in succession swings back and strikes its fellow, a fact which seems entirely to have escaped the Professor's calculations, and which, of course, has never yet found a place in the text-books.

We do not doubt but that the striking ball gives up its “whole force” to the struck ball, just as Prof. Goodenow teaches. If it did not, it would not come entirely to rest. Then why does not the struck ball take up the entire *motion* and go on just as far as the striking ball would have gone if unimpeded, and keep that motion up “indefinitely,” as Prof. Goodenow positively says it does do, and as experiment says it does not do, as just shown? Plainly the answer is, some of this striking force has each time to be consumed in overcoming the inertia of the ball at rest, and the remainder goes into its motion. That is the whole secret, and it shows that elasticity does not and can not convert all the force into motion when there is inertia to be overcome as in this case.

So it must be in the nature of things with the 20,000,000 tons of suspended air-particles that the insect puts into motion by the kick of its tiny foot, and with a force in addition sufficient

to bend in and out, 440 times a second, 2,000,000,000 tons of ear-drums, if the wave-theory be true, as we have repeatedly and mathematically shown. Each of these suspended air-particles weighs a certain amount, as a matter of course, and has a certain quantity of inertia to be overcome by the striking particles first set in motion by the locust—the process, as all admit, being precisely the same as in the case of the suspended row of ivory balls set in motion by the ball first let drop. Common sense tells any man who will stop to think that no force sets the row of balls in motion, or sends off the last ball, except the force of the ball let drop. Hence it is the same precisely with the locust; and consequently in communicating motion to this enormous mass of suspended but ponderable matter, the insect has to expend just as much original mechanical force in its stridulating effort (as Prof. Comstock admits and as Prof. Goodenow will not venture to deny,) as it would require to displace the same weight of suspended ivory balls, or a row extending 400 times around the earth—a distance of ten million miles! Is Prof. Goodenow prepared to say that a locust can accomplish such an achievement?

Thus the bottom drops completely out of the wave theory, demonstrating as Prof. Goodenow must see, that the sound of the locust which permeates the four cubic miles of air cannot be the mechanical movement of this mass of matter as the result of the transfer of the almost infinitesimal force imparted by the strength of the insect. And if it is not motion, what is there left for it to be except an incorporeal substance analogous to electricity, light, odor, etc., as Substantialism teaches? What need we of further witness? And is it possible that trained scientific minds cannot now begin to see the prodigious folly of trying to defend a theory envired by so many practical difficulties? To say that a locust cannot fill that extent of space with any kind of substance without exhausting itself, is a superficial conception as to what incorporeal substance is. Take substantial *right*, for example. The *fire-fly*, a hundredth part the size of the locust, can be seen half a mile of a dark night. Hence it fills that entire space in all directions hundreds of times an hour with a real substance (or with waves of Tyndal's "jelly"-ether if preferred,) without the least perceptible exhaustion of its physical structure! And a grain of dry musk will emit even a material substance (odor) so attenuated as to fill cubic miles and continue to do so for months (as shown in the *Problem of Human Life*) without any exhaustion of its substance that

can be detected by the most delicate balance. Thus the Substantial theory of sound has all the facts and analogies of Nature in its favor, while the wave-theory, as just seen by the mistaken experiment with ivory balls, encounters insuperable mechanical difficulties at every turn in the investigation.

Now we ask the reader in all candor what Prof. Goodenow could possibly have meant by such an argument as that totally mistaken elastic action of a row of ivory balls, except to help the wave-theory in its desperate contest with our locust? Plainly if the "whole force" of the striking ball is transferred to the row and converted into "motion," and if this motion will go on undiminished through "any number of balls" actually displacing them all, with the row meanwhile extending "indefinitely," and driving the last ball away "*as if it were the ball let drop*," all by the aid of elasticity, why, as a matter of course, wave-theorists are entirely right about the four cubic miles of air; and hence the insect has only to kick the first air-particles against the next adjacent ones, and *elasticity*, as Prof. Goodenow describes it, at once steps in, *awakens* its own force, takes up the work, and then goes on "indefinitely" compressing the air and overcoming inertia till it has displaced 20,000,000 tons of ponderable matter, and condensed it with an additional force sufficient to bend and shake 2,000,000,000 tons more of solid, tendinous drumskins! Not only so, but the monstrously false and ridiculous theory of sound teaches that this weak insect has not only the strength thus to start a motion that will overcome the inertia of those 20,000,000 tons of suspended matter, with an additional mechanical force sufficient to shake 2,000,000,000 tons of ear-drums, but that it exerts a mechanical *squeezing force* upon the whole four cubic miles of air permeated by its music, sufficient to generate *heat* enough to add *one sixth* to the velocity of its own sound; that is one-sixth more than it could have had without such heat, or an actual additional velocity of 174 feet a second! All this prodigious nonsense is taught for science by the wave-theory in every college in the land as expounded by learned professors, and is unavoidably indorsed and supported by Prof. Goodenow in his wretched misconception of the simple facts concerning a row of suspended ivory balls, as his total failure to take into account the inertia that has to be overcome in every ball moved, abundantly shows. Of course, Profs. Comstock, French, Carhart and Stahr will be jubilant over such an accession to their ranks. But there is no use in trying, either openly or covertly, to help the lost cause of undulatory

acoustics in its desperate extremity. We have it completely squelched, and neither ivory balls nor saltpeter will save it. If any one wants proof of the correctness of this remark, he has only to read and study the whole argument presented in this single reply—which is not yet more than half completed—and he will be satisfied.

One of the most surprising things in Prof. Goodenow's present paper, as already hinted at, is the fact that he should persist in speaking of elasticity as a "force,"—"elastic force,"—and of elasticity being "awakened" as "a new force," etc., after the locust has done its work, and all in defiance of the dictionaries which only define it as a "quality" or "property" of a body that permits a given external force to be stored up, transferred, or distributed in a certain manner. Nothing but slovenly reasoning upon matters of physical science would ever lead an investigator thus to mix up definitions and confuse simple facts. Why; the thing is self-contradictory on its face. Prof. Goodenow himself shows that the only way in which the elasticity of a body can come into play or be utilized is by that body being first *indented* by the application of external mechanical force. No ivory ball in the row can utilize its elastic property by which to start the next ball until it is first indented, and that indentation requires force which must come from the previous ball, and the force of that from the next preceding one, and so on back to the force of the first ball let drop. So, precisely, with the 20,000,000 tons of suspended air-particles; all motion and indentation throughout the four cubic miles can be only traceable back to the physical strength of the locust as its exclusive source. Is it possible that we have thus to enter into the minutia of the elementary principles of dynamics to enlighten a great mathematician and physicist? As proof that such loose methods of reasoning result from a want of clear scientific ideas, we have only to observe that the Professor, in the same connection, where he speaks of awakening this "*elastic force*" of the air, after the locust strikes it, admits that there is no such force, but that the original force exerted by the insect does really all the shaking of the air that is done, and that no "new force"—elastic or any other—has anything to do with the displacement of the air, but only the original strength exerted by the locust. We are careful about what we say. Here are his words which the reader will critically examine:

"The force producing the whole tremor is that impulse which makes the first indentation—whether the slight dent in the first ivory ball, or the larger dent in the first portion of air.
* * * * But as thus diffused abroad it is only

the original force transferred in the lapse of time to other mass," etc.

This is explicit, and is exactly what we teach about the nature of elasticity, and the manner in which it permits a locust to overcome the inertia of a certain quantity of air or the same weight of ivory balls, to the extent only of its physical strength. What scientific fallacy (we had almost said perversity) then, immediately after, to speak of the air-particles going on "*to jostle themselves in a sense*, that is, *by their own elastic force thus awakened and successively transferred*"! Yes; after just saying that "*the force producing the whole tremor is that impulse which makes the first indentation*," and that "*as thus diffused abroad it is only the original force*," he deliberately contradicts it by having the air-particles "*jostle themselves*" by awaking their own "*elastic force*" or a "*new force*" as he calls it, to do what he knew in his soul the insect of itself was incapable of doing! What could possibly have led to this contradictory confusion of ideas, if it were not an unconscious desire to give aid and comfort to Professors Humphreys, Carhart, French, and Stahr, in their childish plea that "*the wave as soon as it is started moves of itself*, and the locust has nothing more to do with it"?

Really we did not suppose that Prof. Goodenow could ever be betrayed into teaching such transcendent fallacy as this. Just look at his involvement. If elasticity causes a body to go on and jostle itself after the initial impulse is given, why did not the Professor tell us in plain English, in letting one ivory ball fall against the end of a row, that the farther end ball bounded away of itself "*in a sense*" on account of a "*new force*" or of its "*own elastic force thus awakened*"? No; he gives us no such scientific nonsense, but tells us plainly that it was the force of the first ball let drop, and that force alone, which passed through the row and produced the entire motion. How true and how plain!

A dog trotting over a large bridge, will shake violently the whole structure, provided his steps shall happen to correspond with the vibrational number of the size and tension of the bridge. But Professor Goodenow would say that the bridge, "*goes on to jostle itself in a sense*," after the dog makes the first step! Why, even the dog could tell the Professor, if he could speak, that there is no "*sense*" in such science; and that his dogship did all the jostling that was done by taking advantage of the elasticity of the structure and so timing his steps as to suit its pendulous swing. We think it is high time that great scientists stopped this childish talk about inert bodies of matter "*jostling themselves*" in any sense.

But now we come to consider the most mischievous error involved in Prof. Goodenow's paper, and the one upon which the wave-theory of sound is mainly based, namely the transmission of pulses through the open air as illustrated by the effects of suddenly shoving a piston into one end of a long tube thereby driving a condensed pulse of air out at the far end. This problem Prof. Mayer treats substantially in the same way, as we showed by recent quotations from his article on "Sound," in the *American Encyclopedia*. A notable fact, in regard to this argument of Prof. Goodenow, is, that he does not pretend, while presenting it, to take sides with the current theory of sound, and thus squarely join issue with THE MICROCOSM on that controverted subject; yet, it is very plain, that every step he advances he is directly in harmony with that theory, walking exactly in its beaten path, as far as he ventures to go, and thus striking (without so avowing it) blows against our new departure, and consequently against Substantialism. We had hoped that Prof. Goodenow was a genuine Substantialist by this time—which he could only be by a broad recognition of the fact that all the forces of Nature, including Sound, Light, Heat, Gravity, Electricity, Magnetism, Life, Soul, Spirit, etc., are real, substantial entities. But he is clearly with the wave-theorists, and has adopted the "mode-of-motion" philosophy, as this *tube* illustration shows; and being thus a foeman worthy of our steel, we will try if the true light can not be made to flash into the darkness, which so far comprehendeth it not.

The reader will carefully re-examine his argument on the tube and piston illustration, beginning at the tenth paragraph, counting from the first. He there teaches that if the piston be pushed into the tube one inch, a condensed pulse will be driven through the tube at a certain velocity (dependent on the nature of the fluid medium, of course), but: "If the shoving of the piston has been two inches, instead of one * * * it has required double force to shove, and *double force or intensity of motion is communicated all the way to the other end.*"

Yet he adds, as we understand him, and in accordance with Prof. Mayer and the wave-theory, that this two-inch instantaneous shove of the piston will not convey the pulse through the air of the tube any swifter than will the one-inch shove, or a quarter-inch shove, for that matter! Why does he take this most illogical and contradictory view, after just saying that the two-inch shove has communicated "double the force, or intensity of motion" to the air, "all the way to the other

end"? Plainly, he had switched off on the narrow-gauge track of the wave-theory, that sound is only a "mode of motion," and he must make all air-pulses or air-waves, whether strong or weak, travel through the air of the tube, with the same uniform velocity—since all sounds, soft or loud, are known to travel at one uniform speed. He evidently had taken his cue from Prof. Mayer and Sir Isaac Newton; and as he was helping the wave-theory, as a philosopher merely, and not as a partisan, he concluded to keep with it, also, in this most hazardous position. It is barely possible, however, that we have misunderstood the Professor's meaning, as he is quite obscure at this point in his argument. If we have misunderstood him, and if he does not intend to teach that every condensed pulse will pass through the tube at the same velocity, whatever the force of condensation, then he denies the truth of the wave-theory, as well as flatly contradicts Prof. Mayer. We will be glad to have the Professor say we have misunderstood him, for that brings him squarely over to our side, and proves that air-pulses are not sound-pulses at all; since, as before stated, all sounds, whether caused by a strong or weak motion in the air, will pass through the tube at one uniform rate of speed. We shall assume, therefore, that we do not misinterpret him, till such time as he sets us right, and thereby gives up the wave-theory.

Prof. Mayer not only takes the same view, that all *shoves* of the piston, with whatever force, or moving whatever instantaneous distance, will send an air-pulse through the tube at the same uniform velocity, namely, the *exact velocity of sound*, but he reverses the operation, and claims that a sudden *withdrawal* of the piston acts on the same principle, causing a rarefied pulse to travel through the whole length of the tube at the same velocity that a condensed pulse travels—that is, *at the exact velocity of sound*. Let us now try to expose the fallacy of this entire doctrine to the reader's comprehension, since, clearly, the wave-theory stands or falls with it.

Suppose a tube a mile long, with a piston fitted, as suggested, in one end of it. Now, it is not practicable to shove a piston into such a tube, different distances, instantaneously. But we can do the same thing, in effect, by discharging small quantities of powder, directly in front of the piston, by means of an electric spark, which will generate instantly a quantity of gas, duly ascertained, corresponding to the quantity of powder used. Then, suppose we discharge powder to make gas of the density of air, or fifteen pounds to the square inch. ex-

actly sufficient to fill one inch of the tube. This, of course, would be equivalent to the instantaneous shove of the piston one inch. The pulse would thus travel through the length of the tube, at a certain velocity. Then, suppose that we discharge powder enough to fill, instantaneously, *ten inches* of the tube with gas of the same pressure. It is the distinct teaching of Prof. Mayer, and the wave-theory, that this ten-inch instantaneous pulse will travel no faster through the tube than the one-inch pulse travels. Is such a doctrine reasonable, where the ten-inch pulse has ten times the mechanical power and, as Prof. Goodenow admits, will communicate ten times "the *force or intensity of motion*" to the air of the tube "*all the way to the other end?*" We assert, that it is absurd, on its face, to claim that the two pulses, thus instantly produced, will travel at the same velocity through the length of the tube; and Prof. Goodenow's law, that the force of the condensation determines "the *force or intensity of motion*" flatly contravenes such a position. If he and Prof. Mayer are right, then should they discharge enough powder in front of the piston, to fill the entire tube with gas, of the density of air, it is plain that the pulse would travel no faster through the tube, with this enormous pressure behind it, than would a pulse with only the sixteenth of an inch pressure of gas driving it. This is the science of the schools, as taught by our highest text-book authorities. But is such nonsense to be believed, because it is laid down in the books and in contravention of every principle of dynamics and common sense? In our humble judgment, men who could teach such philosophy, could as readily teach that a single grain of powder, discharged behind a bullet, would drive it with the same velocity as would a full rifle charge.

Now all this philosophical teaching about air-pulses traveling with one and the same velocity, whatever the condensation that drives them, must of necessity be true if the wave-theory of sound be correct; for according to that theory all sounds, soft or loud, are but air-pulses of different degrees of condensation; and all sounds soft or loud are well known, by repeated observation, to travel with the same uniform velocity. Of course, then, the wave-theory stands or falls on the correctness of this tube-illustration, as urged by Professors Mayer and Goodenow. Hence it is, that we devote considerable time and space to its careful consideration, dry as the subject may seem to some, but which every scientific reader who takes this Magazine, we trust, will appreciate.

But this consideration of *condensed pulses*

driven through the tube involves only one half of the real problem upon which the life of the wave-theory is now suspended. Every condensed pulse of air includes, also, a *rarefied* pulse accompanying it. Hence the wave-theory teaches that all sounds are composed of a series of "condensations and rarefactions" of the air that follow each other in rapid succession, or at the velocity of sound. Hence it is that Prof. Mayer most consistently reverses the illustration of the tube and the shoving of the piston into it. He teaches that if the piston should be withdrawn instantaneously a certain distance it would tend to cause a vacuum, and that a *rarefied pulse* would thus be made to pass through the length of the tube, to equalize this vacuum, with the same velocity precisely that a condensation of the air would travel by a shove of the piston into the tube. Of course this reasoning is a logical necessity of the wave-theory; since it is plain that the "condensation and rarefaction" constituting a sound-wave, if such be the fact, must both travel with the same velocity. One half of a sound-wave will hardly be permitted to run away from the other half! But before proceeding with our sifting process here, we must confess that a greater want of scientific discrimination or philosophical discernment occurs nowhere in our reading than in this same weak fallacy. Let us illustrate it. It is plain that an instantaneous withdrawal of the piston one inch would leave a one-inch vacuum behind it, which the air of the tube would immediately rush back to fill, under a pressure of fifteen pounds to the square inch. If the piston again were instantaneously withdrawn two inches, making a two-inch vacuum, the air in the tube would still rush back to fill it with the same velocity precisely, having only fifteen pounds atmospheric pressure to drive it, and consequently the rarefied pulse thereby caused would travel through the length of the tube at exactly the same velocity in both cases—being only induced by the same fifteen pounds of atmospheric pressure in the tube. But how different is this from the various condensations caused by the different distances the piston is instantaneously shoved into the tube, *each different distance making a different atmospheric pressure in the tube by which to drive the pulse and give it velocity!* Cannot scientific men see this distinction? or must it be hammered into them month after month, in these columns, before it will make an impression? Possibly we may assist Professors Mayer and Goodenow by supposing a case, and thus help them to see the fallacy of both condensations and rarefactions in this tube-illustration representing the propagation of sound. Suppose,

before creating the rarefaction by a withdrawal of the piston, that the tube is charged with two atmospheres (thirty pounds pressure), and the far end closed, to exclude the outside air. Can any thoughtful investigator fail to see that the one-inch vacuum thus instantly produced would be filled with air quicker under this double pressure than if only a single pressure forced back the air? And if such double atmospheric pressure would fill the vacuum quicker, of course the same rarefied pulse that fills the vacuum quicker would also travel correspondingly swifter through the length of the entire tube. To make it still plainer: Suppose the tube to be charged with but the *one hundredth* part of one atmosphere, and the piston to be instantly withdrawn one inch, thus creating a one-inch vacuum as before. Plainly, under such trifling pressure of air, this vacuum would be much longer in filling than if a full atmospheric pressure were forcing the air back. Then suppose the tube to be charged with one hundred atmospheres and the same withdrawal of the piston should occur; common sense must tell any man who will take the trouble to think, that under such intense pressure, the one-inch vacuum would fill correspondingly quicker, and that the rarefied pulse would pass away through the length of the tube at a corresponding rate of velocity. This is but plain common sense, and of course it applies with the same invincible reason to the varying velocities with which condensed pulses must also travel under various degrees of force or atmospheric pressure by shoving the piston different distances into the tube. As the amount of atmospheric condensation or pressure, causing an air-pulse, must thus demonstrably determine the velocity of the pulse, it equally demonstrates the total fallacy of the theory that sound consists of such air-pulses, since all sounds, whether caused by the mild movement of a tuning-fork's prong or the thundering blast of a hundred-ton Krupp gun, travel with exactly the same velocity. No, no! gentlemen, it will never do; the contest might as well end now as in the near future; for end it must, soon or late. And the way in which it must inevitably end may be judged by this tube argument, taken in connection with Prof. Goodenow's ivory balls.

There are many other weak and objectionable points, in the Professor's paper, which we would like to notice, had we space to spare. Take, for example, the adroit boost he gives to the wave-theory, in comparing the insect's power over a large mass of air, that "jostles itself in a sense," to the touch of the infant's hand, that moved the electric key, that closed the circuit, that permitted a natural law to

convey the electric force to the magazine of dynamite that exploded, and thus blew up the ledge of rocks at "Hell Gate!" Now, let us ask, if the dynamite exploded itself "in a sense?" Then did the rocks burst asunder, and fly up of themselves, in any sense? Plainly, there is no comparison whatever in the two cases, and Prof. Goodenow knows it. It is simply another illustration of that slovenly way of reasoning, which no scientist should ever indulge in. In the first place the insect, as the Professor distinctly admits, does everything that is done in the way of supplying the force for displacing the 20,000,000 tons of air, which must be displaced according to the wave-theory. Remember his words: "*The force producing the whole tremor, is that impulse [of the insect's foot] which makes the first indentation*"! No other force, therefore, can be brought into play in overcoming the inertia of the four cubic miles of air, elasticity not being a force at all, but merely a *property*. But how is it in the other case? The infant's hand closes the key, and that is the end of the force it exerts. Its energy does not extend another inch; but at this juncture two other forces step in and take hold of the work of rending the rocks. Dynamite, remember, is but highly concentrated *mechanical force* which, in this case, the force of electricity brought into service! Is any reader of this argument so superficial and blinded, that he cannot see the want of all similarity between the action and claimed effect of the insect on four cubic miles of air, with no other force to aid it, and the action and effect of the infant's hand, in touching that electric key, with several real forces then added?

But we must dismiss the subject for the present, trusting that our learned contributor, instead of making indirect pleas for the fallen theory of acoustics, will come out squarely and manfully, in its defense, and let us know just how to take him. Let him, in his next paper, answer unequivocally our argument, just given, on the ivory balls, and on the condensations and rarefactions sent through a long tube. Then, let him tell us how any condensation of the air can be transmitted, or even generated, by a body moving through it *at a velocity of only one inch in two years*, and we will forgive him.

P. S.—Since the foregoing article was written and prepared for the compositor, we have received a letter from Prof. Goodenow, disavowing any intention, on his part, of giving aid and comfort to the wave-theory or against Substantialism, in his argument on the "elastic transfer of force;"—that he was, as he says,

entirely "non-committal, letting the established theory have the first claim, of course, till it is disproved; and not feeling confident, yet, whether you can bring sufficient objections to disprove it, or not."

We give the Professor the benefit of his disavowal; but we must say, that we regard it as anything but the true spirit of independent investigation, to give the "first claim" to any theory, that has been seriously called in question, with numerous and cogent reasons for rejecting it as a fallacy of science. Our ideal of a true scientist is, to give no theory the "first claim" in our philosophical investigations, but only to give "first claim" to truth, wherever it may lead us. The very fact of giving "first claim" to the wave-theory, shows plainly his bias, and that he was not "non-committal," in the true sense of the term; but, as his argument shows, that he leaned strongly toward that side of the question, all the way through his elastic discussion, whether he knew it, and intended it, or not. If he has been heretofore really undecided as to our ability to "bring sufficient objections to disprove" the wave-theory, possibly this reply to his unfortunate oversights may help to determine the matter, as we trust it will.

"SOMETHING OUT OF NOTHING."

(Since receiving Dr. Stone's paper printed elsewhere, it has been supplemented with the following letter, impatiently urging us to reply if we can. We give it to the reader that he may have the whole matter before him in the strongest possible light, before reading our reply.—EDITOR.)

OMAHA, JAN 13, 1884.

A. W. HALL, LL.D —*Dear Sir:*—You announced some months ago that you would close the columns of THE MICROCOSM against the discussion of "Something from Nothing," which you had a right to do; but when you continued to give a whack at it in every number since, express or implied, and especially in the last, in review of Clark Braden, I think it is but fair that you should reply to my two letters touching the miraculous aid given to a widow by which Elijah and herself and son, lived a whole year upon "a little meal in a barrel and a little oil in a cruse," enough to make "two little cakes;" and that other widow who by the direction of Elisha, borrowed many jars and filled them from the one she had, and paid her threatening debt and "lived of the rest;" and the two miracles of the "Loaves and fishes;" and that of the added elements to the wine in the marriage feast at Cana. Now if you can interpret those five cases, and not find "something from nothing," let me see you try it; or close your curt allusions to "something from nothing." I was not desirous of appearing in your columns again upon the subject; but knowing that Bible readers would be very likely to be hanging upon those facts for the support of the Creation theory, I judged it fair that those five witnesses should be allowed to come to the stand, and let the verdict have the effect of their testimony. If you can dispose of their

testimony without "something from nothing," I should be very glad to know how. I can conceive that you may "condense from the substance of God," but I dare not. Very respectfully yours,
M. STONE

REPLY TO REV. M. STONE, D. D.

We assume that the reader has carefully examined Dr. Stone's paper and his subsequent letter, printed elsewhere, as he should do before reading this reply. With that understanding we are ready to proceed.

Now, first and foremost, we declare in all honesty and sobriety that we did not want to write another article on this question, and did not intend to, and would not have done so had we been let alone and not forced into it. In our reply to President Braden in the *Christian Quarterly Review* as printed in the January *Microcosm* we explained the matter in such a way that we supposed no living man could reasonably object to our position, and the rational manner in which it was presented. We there showed that it was vastly more thinkable and reasonable, to begin with, to suppose one thing to be made out of another thing, as all experience verifies, than to suppose a real thing to be made out of absolute *nothingness*—a fact never observed. We then proceeded to show that there was no necessity for the latter unthinkable supposition when the former thinkable one was easily supposable and ready to our hand. This, as we also urged, did not involve the eternity of matter at all, nor did it involve the condensing of a fraction of God's spiritual substance into matter. We pointed out as clearly as we had words in which to express it, that the substantial but immaterial forces of Nature—heat electricity, gravitation, etc.—might easily be supposed to be co-eternal with God himself, and might from eternity have constituted His exterior nature or clothing, so to speak, from a mere fraction of which He might have condensed or synthesized the most refined material elements—such as oxygen, hydrogen, nitrogen, carbon, etc.—from which by other synthetic or condensing processes He might have formed gross matter, thus creating the "things that are seen" *out of the things that do not appear*. Surely this is a vastly more rational or thinkable view than supposing that all this creation took place out of nothing at all. In a word, why *suppose nothing* when you have *something*?

Dr. Stone thinks and insists that the creation of something out of nothing, though unthinkable is not any more so than self-existence and eternal succession. But we do not have an "eternal succession" in our theory, since we suppose God to have begun creation from a real substance that then existed, that had always existed which, though not matter yet existed from eternity with God himself as an exterior portion of His own substantial being. This view of God's nature and personality surely is not unorthodox. If any difference it is more than orthodox, being orthodox in everything that Jew or Christian can claim for the character of God, with the substantial but immaterial forces added as a part of His exterior being and as His personal instrumentality through which He operates in Nature and out of which He created the material universe. Thus Substantialism comes

to the aid of old-fashioned orthodoxy by helping it out of an unthinkable and irrational dogma which it was originally forced to adopt, as part of its creed, simply because its founders did not know what the substantial philosophy was, or what it has since brought to light, namely, that the forces of Nature, while immaterial substance and a portion of God's exterior nature, are at the same time not matter in the materialistic sense of the term.

Of course we are free to admit that the self-existence of God, as *the First Cause* and without a cause, is unthinkable. But why involve ourselves unnecessarily in two or more unthinkable propositions when one answers every purpose? The less number of unthinkable suppositions we mix up with our religious philosophy, the better and easier it will be for our fight of faith, surely. We are obliged to confront and admit one unthinkable supposition, to begin with, as the only rational solution of all minor mysteries in the universe, and that one unthinkable cause of all subsequent effects is God. Why then, after postulating this one necessary and unavoidable unthinkability, pile up others for the overburdening of our faith by supposing the unnecessary process of the creation of something out of nothing, when God had an abundance of substance ready at hand out of which to create the universe? For our own part we are not so fond of unthinkabilities, either in religion or philosophy, as to add them to our creed unless we are absolutely forced to do so, just to test the capacity of an omnivorous faith. And we think even Dr. Stone will see, by this time, that we are under no such necessity, viewing electricity, gravity, heat, etc., as immaterial substances existing with God and as His adjuncts and instruments from all eternity. We surely can conceive of the idea of an infinite God creating one thing out of another thing, even if the thing made and the thing from which He made it are vastly different from each other. We do such things ourselves every day, and such a possibility is a matter of common observation and experience. Let us then simplify our religious philosophy as well as our science and get rid of as many unthinkable mysteries as possible, especially where there is no necessity for them; and not uselessly overburden our faith by wringing them into our creeds just for the mere love of inconceivabilities.

We object decidedly to Dr. Stone's reiterating the phrase "creation-theory," as he does, and applying it to his view; thus placing us in a false position. He repeats this objectionable phrase three or four times in his short paper, just as if our view ignored "creation." Surely ours is as much a "creation theory" as his; only his is creation out of nothing, while ours is creation out of something, and is far more consistent with all human conceptions of the fitness of things than his can be.

In view of this brief and explicit explanation, how singular is the statement of the Doctor, that "The belief of the production of something out of nothing is the only possible account of the visible universe, unless we assume the absurdity of eternal succession or self-creation." Dr. Stone surely could not have read our argument in reply to President Braden, or even what we said on the subject in the

Problem of Human Life, or he would not only have seen a "possible account of the visible universe," but a very plausible account, as we have just reiterated it, without either "eternal succession," "self-creation," or making "something out of nothing; and that is the comparatively simple process of making one thing out of another.

Having thus answered the Doctor on the ground of reason and the fitness of things, let us come to his five important witnesses which he supposes to be conclusive proofs from Holy Writ in favor of the "Creation Theory," as he is pleased to designate it. We are simply surprised that so profound a thinker and so experienced a biblical critic as our learned contributor could have resorted to evidence so manifestly wide of the mark, and even so directly against him. Let us examine the five witnesses.

Take the case of the turning of water into wine, first. Now all wine is but water, or the juices of the earth and air, chemically changed by the natural processes of passing through the vine and the growing grapes for a certain length of time, and which are thus turned into wine by a law which God himself ordained for this very purpose, namely, the changing of these circulating juices and elements into actual wine. Christ, however, as the Incarnate God of Nature, had only to carry forward the same process more rapidly than it is done by ordinary natural law, to make the best of wine out of pure water in a few minutes; and such it was pronounced by the master of ceremonies on that occasion. Strange as it may seem, this prominent witness, so far from sustaining the Doctor's position of the creation of the wine out of "nothing," positively tells us that the wine was created out of the water; or in other words, that the water, was turned into wine! Was anything ever plainer than this? Now the query is, does the Doctor really believe that water is "nothing"? It would seem, so by his argument. We are perfectly willing to accept such kind of "nothing," as the basis of our "creation theory."

Take, then, the case of the loaves and fishes, as another witness in favor of creation of something out of nothing, and it will be found just as contradictory of the Doctor's position as the turning of water into wine. There is not a loaf or a fish in existence whose material substance was not collected infinitesimally from the material elements of Nature everywhere around us. Of course, in the natural order of things, the loaves and the fishes were produced and their particles gathered together by a slow and complex chemical and physiological process of growth, which the God of Nature ordained for that very creative purpose, and by which every fish and every barleycorn that ever existed were made. Now if Christ was, as all Christians believe, a representative, at least, of the very God who ordained these natural processes for creating grain and flesh, it is plain that He increased the quantity of bread and fish to feed the 5,000 people by simply hurrying the very same process which Nature uses, but without the detailed instrumentality and circumlocation which Nature herself has to employ. That is to say by the simple creative fiat of His miraculous power He bade the sur-

rounding elements contribute from their storehouse the requisite atoms of material substance and concentrate them appropriately into the loaves and fishes, thus expanding them by a process of growth or accretion as fast as pieces were cut from them, and even faster,—thus keeping up the supply of both loaves and fishes from the very material elements of surrounding Nature, and by using the very same ingredients for each that Nature herself used in making the original loaves and fishes, only by a less circuitous process. This is what we call a rational and philosophical exposition of Scripture miracles, and such an exposition as addresses itself to the common sense of the philosophical skeptic. But what rational skeptic could ever believe the improbable doctrine of our learned contributor, that Christ's miracle consisted in supplying the material for augmenting these loaves and fishes by creating it (the material) out of nothing, while the surrounding elements of Nature were full of the very same materials out of which both loaves and fishes were originally made? If Dr. Stone really preaches to his congregation such irrational expositions of the miracles of the Bible as he has here given forth to bolster up an unthinkable theory of creation, we doubt if he will ever have placed to the credit of his pulpit labors the conversion of one intelligent skeptic.

We need not refer to the oil and meal of the widow, which were increased to support her, her son and the prophet during a whole year,—since the true exposition of that miracle is precisely the same as that concerning the loaves and fishes. One would really suppose that a child would have thought of the explanation we have given before resorting to such an unreasonable process as the creating of oil, meal, loaves, fishes, &c., out of nothing at all—especially as just remarked, when all the surrounding elements of Nature are full of the very ingredients constituting those substances and easily accessible to the collecting hand of that God who spoke and acted through the prophet and through the person of the Messiah.

We hope this will be satisfactory to Dr. Stone as well as to others upon this vexed and controverted question, and that we shall hear no more about the creation of something out of nothing. We still believe, as a rule, that THE MICROCOSM can be filled with more profitable discussions; though we trust the true exposition of the nature of Bible miracles, thus inadvertently called out by Dr. Stone's five unfortunate witnesses, will serve a profitable purpose to our readers.

VERY KIND IN ELDER MULLIS.

A PROPOSED BIRTHDAY PRESENT.

We have received the following very kind communication from Eld. G. B. Mullis, of Plattsmouth, Nebraska, which he requests us to print, followed with any comments of our own which we may be disposed to make. We cannot refuse the request of so true and tried a friend of THE MICROCOSM as he has been since its first number was issued; so here is his letter, which he heads

"SCIENTIFIC."

"I read THE MICROCOSM with more interest than any paper I have ever read, and as far as I

know, this is the universal decision of its readers. And, furthermore, all agree that we get THE MICROCOSM for less than its real value; and I presume that a vast majority of its readers would have it, if it should cost twice what it does. Now we must admit that to publish such a magazine at so low a rate as one dollar per subscriber, cannot benefit its Editor at all financially. But then one change, from fifty cents to a dollar, has already taken place, and its subscription price seems now to be fixed at one dollar a year. Yet we must agree, that we get more and better reading than we pay for. But what remedy can be offered? I suggest the following, after due consultation with friends: Let each subscriber save up the small sum of from ten to twenty-five cents, and send this amount, directed to Prof. Joseph Goodrich, care of Hall & Co., 23 Park Row, New York. We are assured that Prof. Goodrich will cheerfully take charge of such remittances, and in the name of THE MICROCOSM subscribers present the amount to the Editor on the 18th day of August next, as a birthday present. Should each subscriber send even *ten cents*, which would hardly be felt by anyone, it would be *one thousand dollars* for the Editor to help hold up his hands in his great work, and would be nothing more than his just due; and nothing more than our duty. Let these plain suggestions be improved upon, if they can be. This I regard as purely *Scientific*, and I trust the Editor will at once give it a place in THE MICROCOSM, and thus let this little financial ball start to rolling; and may it keep on rolling till it has accumulated a fund in the hands of Prof. Goodrich that will make a handsome donation, and thus cheer the heart and strengthen the hands of our Editor.

G. B. MULLIS."

REMARKS ON THE FOREGOING.

We do not agree with Elder Mullis that a single penny is our "due" from any subscriber who has paid his subscription to this volume of THE MICROCOSM, even if not a dollar can be saved up at the end of the year from the proceeds of this magazine—which is the case. One dollar a year is the full price of THE MICROCOSM, whatever it may cost us to produce it, and however hard we may work; and so far from any subscriber owing us a penny—much less ten, twenty, or twenty-five cents—we are deeply in debt to our tens of thousands of enthusiastic readers, for the inestimable gift of their appreciation, good wishes, and generous support. This is all we ask or expect to receive, though it warms our inmost heart to read such generous proposals as those suggested by Elder Mullis. As to a "birthday present," it would surely produce on us a very novel sensation, as we have never experienced such a thing in all our life, even to the value of a button. We do not think it best at this late day for our subscribers to try the experiment on their Editor for fear of consequences. But this does not in the least lessen our gratitude to our very dear and trusted friend for his suggestion.

P. S.—And here steps in Prof. Goodrich, and claims the right to be heard in the matter—since Elder Mullis has taken the liberty of suggesting his name. We therefore accord to him also room for his brief card:

To the Readers of THE MICROCOSM:

"Having been consulted by Eld. Mullis in regard to the proposal to be made to the friends of THE MICROCOSM, I cheerfully accept the responsibility of taking charge of the fund as he suggests, and of

presenting it to Dr. Hall at his 65th birthday, on the 18th of August next, at which time the names of all the donors, with the amounts given, will be read to him, that he may recognize among them the friends who take so much pride and interest in the great work he is doing. I also take pleasure in heading the list with twenty-five cents, it being the highest limit fixed by Elder Mullis. The general result of this little enterprize will be reported immediately after the Editor's birth-day, or in time to appear in the September *MICROCOSM*. Address me, care of Hall & Co., 23 Park Row, New York, as suggested Respectfully,

JOSEPH GOODRICH."

REV. PROF. McCORD OF LINCOLN, ILL.

We regret to take up a single inch of our space, in referring to the above named Professor of Mathematics, in Lincoln University, who has recently been lecturing against our book—the *Problem of Human Life*—and abusing its author.

As reported in the Lincoln papers, among other reckless things, he said:

"The book is without sense or reason. Hall doesn't know right from wrong. He cannot write two sentences without contradicting himself. He is the most inconsistent writer I ever knew. The book impresses no one, and no one believes him—except one deficient in knowledge, or a crank," etc.

Yet this falsifier and slanderer is a professed Christian minister, who holds, also, the responsible position of an educator of the young men of Illinois! A brother minister of his, in the same denomination, who knows him personally, and who is an enthusiastic reader of the *Problem and Microcosm*, being heartily disgusted, as he says, at the shameless ignorance and bigotry of the Professor, writes, urging us to "show up that *egotist* in *The Microcosm*." We only need to quote the above words from his lecture, to expose him most thoroughly to tens of thousands of educated ministers, ("cranks," he calls them) who have read the *Problem* with approval. The lectures of such bigots, will do good in the end—as they cannot, with all their falsification, keep their students from doing a little thinking for themselves; and it will only take a very little thinking for the youngest student in Lincoln University, to find out what ails Prof. McCord.

As a stand-off against the foregoing, we clip from the *Harper (Kansas) Times*, a notice of a lecture, delivered by Prof. Charles B. Titus, of that place, in which he takes a very different view of "Hall," from that of Prof. McCord. The editor says:—

"Chas. B. Titus read a paper, before the Teacher's Association, last Saturday, on the 'Advance of Science,' in which he pronounced A. Wilford Hall, the editor and publisher of '*WILFORD'S MICROCOSM*,' the superior of Isaac Newton, as a scientific discoverer."

Or, if the above is not a sufficient stand-off, here is a volunteer offering, just received from an educated professor—W. L. Beaumont, of Zion's Grove, Pa. Put it alongside of Rev. Prof. McCord's malicious diatribe, and then compare:—

'HALL & Co.,

"GENTLEMEN:—I am studying for the ministry, and am a careful, and deeply interested, stud-

ent of the *Problem of Human Life*. It has been the means of my conversion. I had borrowed the book to read, and it sent a flood of light into my mind. I now shed tears of gladness, whenever I take up the *Problem and Microcosm*, to think what good they have done me. Eternity alone can reveal the advantages I have received from those works, and the deep gratitude I feel toward the author and editor. I praise God, that in His providence, He ever gave a man as wonderfully gifted, as Wilford Hall, to the world, and for the good use he has made of the gifts thus bestowed. His *Problem and Microcosm* are simply glorious. I want you to show this letter to Wilford, himself, that he may get a faint idea of the gratitude I feel, and the obligations he has placed me under. * * * * I remain sincerely yours.

"W. L. BEAUMONT."

THE CHRISTIAN QUARTERLY—SUBSTANTIALISM.

The reader will recollect that we promised, in our reply to President Clark Braden, as copied from the *Christian Quarterly Review* into the January number of the *Microcosm*, that we would send to that *Quarterly*, a paper for its April issue on the new Philosophy of *Substantialism*. We have done so. That paper is a most exhaustive one upon the subject treated, and is entirely new and original, as we cannot write twice alike, and therefore could not be a plagiarist, should we try. It presents the claims of the Substantial Philosophy more elaborately and exhaustively, and in a light more satisfactory, than does any paper upon the subject we have yet written. That article will appear in three consecutive installments in *The Microcosm*, namely, in the April, May, and June numbers—about three and a half to four pages each month—so that our readers shall not be deprived of its valuable aid in unfolding the new Philosophy.

Those of our readers who would like to see the entire paper at once, or without waiting for the June *Microcosm*, would do well to send to Dr. E. W. Herndon, Editor of the *Quarterly Review* at Columbia, Mo. for his April issue, and thus secure a large amount of the most valuable reading matter in addition to this Substantial discussion. And we take the liberty, as well as pleasure, to say here, that we know of no *Quarterly* now published, more thoroughly full of fresh and interesting discussions, on the higher grade of religious topics, than the *Christian Quarterly* so ably edited by Dr. Herndon.

REV. DR. ROBERTS ON COLD.

We have received an ingenious reply from Dr. Roberts, to our solution of the cold-and-heat problem, as printed last month. The Doctor, it seems, refuses to be convinced; and while admitting the facts of our demonstration with the iron bar, as we gave them, he thinks they prove the exact opposite, and sustain his side of the question! We will print his article, with our answer to it, next month, and thus permanently close the cold-and-heat controversy. In the meantime, we announce, on behalf of Dr. Roberts (as he positively assures us), one of the most important philosophical discoveries of the nineteenth century—important, as he tells us, to the cause of Substantialism, and the certitude of a conscious hereafter for humanity. He has not yet given

us the details of this great discovery, nor even has he stated its nature or character; but simply assures us, in the most unequivocal manner, of its paramount, and even overwhelming importance to the world. That revelation will probably follow the winding up of the cold-and-heat discussion, in two monthly papers, from the Doctor's pen, in this Magazine. So look out for light from the far West. If his new discovery is as truly valuable as his papers on the Laws of Mind are important, then will the world derive from it genuine benefit.

REV. GEORGE SEVERANCE.

We take pleasure in printing the able paper of the Rev. Mr. Severance, on "Thoughts Concerning God," as found at the commencement of this number. We do so the more cheerfully, in view of the fact that Mr. Severance is a leading Universalist clergyman, of the conscientious kind, but not one of the bigoted sort who cannot see and appreciate truth, if written by a man who happens to be as conscientiously opposed to his religious views. He was one of the first who sent his name for a copy of *Universalism Against Itself*, on seeing it announced in *THE MICROCOSM*, and has not weakened a whit, on account of that book, in his appreciation of our scientific efforts to break down materialism, as the following note accompanying his article, will show:—

"DEAR DR. HALL:—How goes the battle? Your scientific work is a most important one. Why do not the clergy more generally appreciate the value of your labors? If the Christian citadel is to be defended against the assaults of atheistic infidelity, yours is certainly the only promising line of defense. You can have but little idea of my desire to form your personal acquaintance. I would sooner part with any volume I possess, than be without your *Problem of Human Life*. I am surprised that some of the representatives of the atheistic school, do not take your book in hand, and attempt its refutation. And it is a shame to modern science, that none of its great champions can be induced to show cause why your departures and theories should not be accepted; for it is plain that the old Ptolemaic system of astronomy was not more thoroughly annihilated by Copernicus, than have been the theories of the six scientists, you have reviewed in your book, and whose faces form its frontispiece. May God bless you, is the wish of your most sincere friend,

SOUTH ROYALTON, VT. G. SEVERANCE.

OUR LIFE-SUBSCRIPTIONS A GREAT SUCCESS.

The Life-subscription offer for *THE MICROCOSM*, of which we gave the first announcement in the January number is a complete success. The \$15 orders for books, at our lowest wholesale prices, are already coming in many times faster than we had dared to hope, and much enthusiasm exists upon the subject among our subscribers and agents. The explanation we gave last month, showing how we can afford to carry life-subscribers as a matter of business, and showing, at the same time, why no other publishers can afford to make the same offer, has completely solved the problem, and assured the pronounced success of the plan. (See Feb. number, page 221, and also last page of cover for our wholesale prices of books.)

One agent asks if *new subscribers* to *THE MICROCOSM* at \$1 each can be counted in with

books when sending the \$15 order. We answer, Yes. Another asks if he can have a life-certificate for each \$15 order he sends, and if such certificates are transferrable. We answer also, Yes. Agents can thus make a profit, in addition to that on their books, in negotiating life-certificates to those wishing to become permanent subscribers. By *life-subscription* is meant—*during the lifetime of the holder of the certificate*. Those ordering from the Pacific slope, where it would cost too much to send by express, should remit postage for the books in addition to the \$15. Any person can make the order by Express "C. O. D.," by remitting \$2 in advance. We make this concession to oblige several of our agents. The life-certificate is now engraved and printed ready for subscribers, from a most unique and exquisite design by a Bank Note Co., of this city; and is pronounced, by those who have inspected it, a beautiful work of art as well as a treasure, of which every holder may be proud.

Address HALL & Co., 23 Park Row, New York.

PROF. MAYER FRIGHTENED.

The great representative physicist of America—Prof. A. M. Mayer of Stevens Institute, Hoboken, N. J.,—has recently had a bad scare. A Professor Rogers of this city, hands us a correspondence which he has had with the Hoboken Professor on Capt. Carter's Report in the December *Microcosm*, and our great demonstration on the slow motion of a tuning-fork's prong, that is decidedly telling and very suggestive. This correspondence will appear next month, as we have not room for it in this number, and the reader will see a rich specimen of the manifest weakness and want of courage in our greatest modern scientists.

OUR REPLY TO PROF. GOODENOW.

We find, after this reply (our leading editorial this month) is in type, that it is longer than we intended it to be, and longer by two or three pages than we purpose to have any articles in the future. The subject, however, and the intricate points discussed, were such that they could not be brought out clearly in less space. To the investigator or lover of the nice things in physics, the article, long as it is, will be full of interest.

PROF. FERRIN ON EVOLUTION.

We have received another paper from Prof. Ferrin in reply to our strictures upon his first paper as printed in the January *Microcosm*. We shall print his second paper as soon as we can find room for it,—possibly next month,—with comments of our own.

LITTLE WILFORD HALLS.

One of the pleasant things, of which we cannot help being somewhat proud, is the fact that we are receiving pictures of numerous young gentlemen, from six months to two years old, with *Wilford Hall* as the first two-thirds of their respective names; as for example, *Wilford Hall Swinney*; *Wilford Hall Stratton*, *Wilford Hall Martin*, etc., to each of whom we have sent as a memento the first and second volumes of *THE MICROCOSM* bound. May these dear little fellows live and grow up to be great men, and prove a hundred-fold worthy of the name and memory which their parents have so kindly seen fit to honor.

WILFORD'S MICROCOSM.

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EVOLUTION ONLY A HYPOTHESIS.

BY REV. J. J. SMITH, D. D.

In the discussion of this subject, it is quite important that the word *Evolution* should be properly understood and defined. More or less confusion has already arisen in the minds of many, in consequence of certain writers confounding the terms *Development* and *Evolution*, by using them interchangeably, as though they meant one and the same thing; whereas, however slight may be the distinction made by our Dictionaries, Mr. Darwin, has given to *Evolution*, a new significance, so that now the difference between the meaning of *development* and *evolution*, has become marked and emphatic, and should be constantly kept in view by all who desire to be clear and specific, in their statements upon the subject. While *development* simply means unfolding, and progress, as from the acorn to the sturdy oak, *Evolution* means that all organization and life, as Heckel says: "Came into existence, not by supernatural creation, but by spontaneous generation out of inorganic matter." *Development* means growth and improvement in individuals and types along the several lines of distinct species. *Evolution* means the transformation of the homogeneous, by some mysterious process of Nature, into the heterogeneous; the simple into the complex; the indefinite into the definite; in a word it means, the origin and transmutation of the types, by which all the species have ultimately been evolved from one or more primordial forms. *Development*, harmonizes with the book of *Genesis*; but *Evolution* antagonizes it. *Development*, is plainly manifest to all; *Evolution* is unseen and unknown. *Development* has nothing to do with the great gulfs existing between the species, while *Evolution* has everything to do with them. *Development*, is an undisputed fact; *Evolution* is only a hypothesis. It never has been proven, and consequently, instead of its taking rank among established propositions, it is solely confined to the region of hypothetical thought and theory. Hence, all who adopt it, do so, not only without evidence, but in the face of many serious and insurmountable difficulties, some of which are the following:

The time was according to the universal testimony of geologists, when in consequence of the intensely heated condition of our globe it could not possibly have contained a single animal or vegetable inhabitant, or even so much as a single life-germ, or seed of any kind whatever, but when it must have necessarily consisted wholly of lifeless, inorganic matter. But now, we see life and motion all around us. Material changes, involving the most wonderful contrivances, combinations, adjustments and adaptations, are incessantly going on in obedience to established physical and psychological laws, by which matter is constantly assuming new forms and conditions. Now, from whence came all this? Surely not from mere matter, for the primary property of matter is inertia. To affirm that all this came from matter, is to affirm that inorganic matter, absolutely *lifeless*, *inert* and

helpless, put forth *power* and *energy* which it did not possess, and which it could not acquire, except by exercising them before acquiring them, and thus without a particle of power or energy, put forth the herculean, the omnipotent *force* of actually producing *something* out of *nothing*, or what is about the same thing, evolving *life* from *death*.

Could a greater absurdity than this be conceived by man? And yet, just such an absurd predicament Evolutionists involve themselves in, whenever they attribute such forces to matter. And therefore, when Prof. Tyndal says, that he sees in matter the "promise and potency of every thing," after having asserted the inertia of matter, he gives utterance to a declaration that is not only nonsensical, but which involves a flat contradiction that would do discredit to a ten year old school-boy.

But it is claimed, in order if possible to get over this difficulty, that organization and life resulted from certain inherent laws in matter. But if so, from whence came those laws? Who made them? for they could not have made themselves. Laws, necessarily imply a law-maker. And, as these laws give unmistakable evidence of consummate wisdom in planning, and skill in executing, they must have come from an intelligent source, and consequently they must have come from without. Hence nothing is gained by Evolutionists, in postulating that matter has inherent laws capable of evolving organization and life; as these laws must in that case necessarily have come from without and from a higher source than inorganic matter. But the plain truth is, matter has no such inherent laws.

The numerous experiments of scientists conducted with great skill and ability; their extended watchful observations, and elaborate investigations, have not only all failed to discover a single case of spontaneous generation, but have actually about demonstrated that there is no life-germ, or life-giving power in mere matter. It is perfectly useless, in the absence of all evidence to continue to assert that Bioplasm in any form is an inherent property of matter. So far as is known, it is always the direct product of pre-existing living, organized matter. All experiments have alike failed to produce it in the laboratory; and even if it were possible for chemists to manufacture Protoplasm, it would be dead Protoplasm and not Bioplasm. Bioplasm is a life-force vastly above and superior to inorganic matter. By its power, matter is controlled and governed. Trees grow upward against gravity, and in spite of it. It metamorphoses and transforms inorganic matter into life-forms by a power that transcends all physics and chemistry; and thus it proves its Divine origin.

But the impossibility to account for the beginning of organization and life, or the introduction of Bioplasm, is only the commencement of the difficulties that beset the theory of Evolution. How, upon this absurd theory, can the marvelous combinations and productions in life-forms around us, be accounted for, especially such as seeing, hearing, etc., and then the still higher immaterial attributes, such as thought, judgment, reason, conscience, &c., all

of which are so signally stamped with unmistakable proofs of a most marvelous wisdom, power, and goodness. Surely these intelligent manifestations proclaim with potency, an all-wise Creator.

TARRYTOWN, N. Y.

THE SUBSTANTIAL PHILOSOPHY AND THE BIBLE.—No. II.

BY JAS. W. LOWBER, M. A., PH. D.

In this number, we wish to call attention to what we believe to be a very important analogical argument. It amounts almost to demonstration. The word analogy is derived from the Greek *aná*, equally; and *lógos*, speech, or reason. It denotes a parallelism between things which in some respects differ. When the difference is very small, and the resemblance very great, the argument from analogy approaches the strength of a valid induction. This method of reasoning is very impressive, and its value is universally acknowledged. Butler's Analogy, one of the greatest works in the English language, is a demonstration of this fact.

God has given man five senses, by which to become acquainted with things external. No one of these senses should be studied without direct analogical reference to the others. In every case it is necessary to distinguish between the sensation itself, and the object which excites the sensation. Some of the recent opponents of the Substantial Philosophy have not been very careful to do this. They have been very reckless in definition. The organ of smell, and the smell of a rose, are different things. The act of inhaling the odor is not synonymous with the odor inhaled. The act of smell, apart from certain physiological questions connected with it, is familiar to all. The character of the odor itself is not so well understood. It is admitted by all to be a kind of effluvia emanating from the odorous body, and coming in contact with the nervous organism. Dr. Carpenter claims that odor consists of particles of extreme minuteness, dissolved in the air, and mostly volatile; yet he admits that the most delicate experiments have failed to discover any diminution of weight in musk and other similar substances by the odorous emissions. But whatever these odorous emanations may be, it is admitted by the most eminent scientific authorities, that they are the substantial objects of smell, which is a refined modification of touch. The atmosphere is only the vehicle by which the object is brought in contact with the olfactory nerve.

The principal characteristics of the sense of smell are also common to those of taste. God has given man the organ of taste, and something substantial to satisfy the demands of this organ. The sapid substances, which are emitted from the body, are brought in contact with the nervous organism, and excite the sense of taste. It would not be possible to satisfy the taste with anything unsubstantial. In fact, we are so organized that we do not wish to deal with the unsubstantial. We expect the substantial in this life, and the life to come.

Many of the characteristics of smell, taste, and touch also belong to hearing and seeing.

All of the senses are, in fact, a modification of touch. In seeing and hearing, as in taste and smell, we must distinguish between the organ of sensation, and that which excites it. In touch, taste, and smell, it is universally acknowledged that the objects which excite these sensations are substantial. If that be true, why are not light and sound, which are objects of sensation, also substantial? As all are modifications of touch, if part are substantial it does appear to me that analogy requires us to conclude that the others are also substantial. As the atmosphere is only the vehicle of conveyance on the part of odor, and must not be confounded with the odor itself; so in sound the atmosphere is only a vehicle, and must not be confounded with the substance conveyed.

The advocates of the wave-theory of sound are unfair in their analogical reasoning. They do not possess the true scientific spirit. In advocating the wave-theory of sound they always compare it with the same theory of light. Why not also compare it with the accepted theory of odor? If there is a difficulty, the true scientist should manfully meet it. The argument from analogy does not amount to anything, unless it will hold true with odor as well as with light. But it is admitted that odor is substantial; may not light and sound also be substantial? The argument from analogy evidently favors the Substantial Philosophy. I do not see how any man can be an honest scientist, and ignore all the facts presented in *THE MICROCOSM*, and in the "Problem of Human Life."

MAN'S MORAL NATURE.

BY REV. JOS. S. VANDYKE, A. M.

Wide as is the divergence in intellectual faculties between man and the lower animals, in moral nature the chasm is still broader, is in fact practically infinite. Quite manifestly it is not merely a difference in degree, but in kind, animals being entirely destitute of moral qualities properly so called. True, they possess social instincts; and in the exercise of these occasionally manifest, in slight degree, qualities resembling those which in the human family are denominated ethical. The horse which apparently carries forward a process closely akin to reasoning, and evidently remembers places which it has frequently visited, seems also to have a certain measure of affection for its companion, and even for its owner. The elephant, which may be teased into a frenzy of rage, is also capable of appreciating kind treatment and possibly feels an impulse slightly akin to gratitude. The lioness, fierce as her nature is, has a measure of affection for her whelps. A monkey has been known to come to the rescue of its keeper when he was attacked by an enraged baboon, thereby seeming to manifest a disposition to requite remembered kindness. Cattle, though sometimes far from manifesting sympathy with each other's sufferings,—as when the wounded are driven from the herd—have nevertheless been seen to stand intently gazing on a dying or dead companion. The queen-bee, though she kills her fertile daughters, quite evidently has a measure of sympathy

with all the members of her well-regulated household. It is no unusual thing to see birds expressing, seemingly, extravagant joy over the nest which contains their happy young; some even build houses which are expressly designed, and exclusively used, for social pleasures. Insects as well as puppies and lambs, sport and wrestle and enter with zest into amusements, sympathizing with the joys of others. Crows have been known to feed a blind companion, thereby giving evidence of possessing the rudiments of what man regards as the highest virtue, unselfish care for the aged and the helpless. The baboons of Abyssinia, before setting out to plunder a garden, choose a leader and enjoin strict obedience to orders on all the members of the company; if any one on the journey makes a noise, so endangering success, his nearest companions give him a slap to remind him of the impropriety of disobeying orders.

Not only do animals appear to possess, though in but slight measure, love, gratitude, sympathy, obedience—qualities usually considered as possessing moral bearings—but also manifest courage, and in some circumstances the spirit of self-sacrifice. The bear, with intelligence adequate to the procurement of food for her cubs, will also rush between them and danger. When a troop of monkeys is attacked by dogs, the males will hasten to the front, showing valor and a readiness to sacrifice themselves for the good of the company; so successfully can they cover the retreat that even the youngest and the feeblest commonly reach the mountains in safety; there they receive the praise which gratitude prompts the rescued to bestow.

Perhaps the nearest approach made by the inferior animals to what we denominate conscience is the apparent sense of shame, bordering on remorse, which the whipped cur seems to experience as he cringingly supplicates a return of his master's favor.

Professor Agassiz thinks that dogs possess a faculty closely akin to conscience.

Without questioning the truth of these and numberless similar facts, we do not hesitate to affirm that there is in the lower animals no quality and no combination of qualities, from which the sense of right and wrong, as it exists among men, could have been evolved. In this affirmation we are unquestionably sustained by the facts of the case, and also by the testimony of naturalists well qualified to express an opinion. Mr. George Mivart, though an ardent advocate of progressive development (not, however, of natural selection, nor of the derivation of man's mental and moral faculties from the lower animals,) boldly asserts: "There is no trace in brutes of any action simulating morality which is not explicable by fear of punishment, by the hope of pleasure, or by personal affection."

Those evolutionists who pursue their theory to the extent of developing man's higher faculties from the Simiade hold that though the moral sense constitutes by far the most important difference between man and the lower animals, still even here, the difference is one of degree and not of kind; that, though there is a wide divergence between the two conceptions, "the expedient" and "the morally obligatory," they are nevertheless the same in origin; that those apes which possessed an instinctive

liking for practices useful to the community, have, through natural selection, perpetuated a more numerous offspring than those possessing tendencies in an opposite direction; that the liking, ultimately, became "innate," and in man has gone on improving, though moral sense is feeble in savages, till it has culminated in the dictum, "Fiat justitia, ruat coelum."

The advocates of this theory, have different methods of designating the bond that unites moral sense, as existent in man, with the germs thereof, as they exist in inferior animals. Some maintain that it has had its origin in the principle of selfishness. This, Darwin pronounces absurd, ("Descent of Man," Vol. I. p. 94,) and affirms that "the moral sense is fundamentally identical with the social instincts," which "have certainly been developed for the general good of the community." "Thus any animal whatever, ("Descent of Man," Vol. I, p. 68,) endowed with well-marked social instincts, would inevitably acquire a moral sense or conscience, as soon as its intellectual power had become as well developed, or nearly as well developed, as in man." Again: "The first foundation, or origin, of moral sense lies in the social instincts, including sympathy, * * * * * The social instincts would give the impulse to act for the good of the community." Mr. Herbert Spencer evolves conscience from the principle of utility, as existent in inferior animals. He declares, "there have been, and still are, developing in the race, certain fundamental intuitions; and though these moral intuitions are the result of accumulated experiences of utility gradually organized and inherited, they have come to be quite independent of conscious experience." Others evolve it from the regard manifested by animals to the highest happiness of the largest number. In the opinion of Sir. John Lubbock, the author of "Pre-historic Times," the moral sense has its origin in deference to authority." This, on examination, turns out to be simple utilitarianism; since, unless there is such a thing as absolute morality (which he denies,) obedience must be produced either by the hope of reward, or the fear of punishment, or the mere pleasure arising from obeying—the motive must be utility.

It thus becomes evident that to develop conscience from the social instincts of inferior animals, it must be regarded as having its genesis in selfishness, in the desire to secure the greatest good to the community, or in a regard to the highest happiness of the largest number, no other sources of moral principle existing in animals—if indeed these exist, and are possible sources of moral intuitions.

As already intimated, the advocates of this theory admit that it is extremely difficult to account for the moral element in man; that this, which Darwin designates "the most noble of all the attributes of man," causes him to differ most profoundly from the simial family. "A moral being," says Darwin, "is one who is capable of comparing his past and future actions or motives, and of approving or disapproving of them. We have no reason to suppose that any of the lower animals have this capacity. * * * In the case of man, who alone can with certainty be ranked as a moral being actions of a certain class are called moral whether performed deliberately after a struggle with opposing mo-

tives, or from the effect of slowly gained habit or impulsively through instinct." Surely, then, we are justified in affirming that it will require a large induction of facts—larger than has yet been made—to establish the proposition that animals possessing social instincts inevitably acquire a moral sense, when there is a corresponding development of the reasoning faculties.

CRANBURY, N. J.

TRANSFORMATION OF NATURAL FORCES.

BY REV. PROF. STEPHEN WOOD.

As we have shown, in a previous number, that the great varieties in material things may arise from the various play of forces upon the primordial substance, differently affecting the particles, so that they arrange themselves, in the formation of each specific thing, in agreement with that particular affection, and that the "Elementary or Simple" substances are such only so far as chemical investigation or analysis is concerned; so we assume that in the great economy of Nature, there is but one primordial force, and that all those different manifestations which we recognize, viz., heat, light, gravity, electricity, magnetism, sound, etc., are only different and varied affections of this universal force. Of the essential nature of these different manifestations, we know but little. We give them names by which they are recognized and study their effects. Although each of the above named forces have distinct modes of action, yet it is possible that no one of them acts entirely alone; and it is well known that in all cases, each of these forms is instantly changed into another form, when the conditions are changed. The ready convertibility of one of these forces into another form is so generally known, that it is not necessary to cite facts.

Each of these forces has also its own mode of conveyance, and when this is suddenly changed that force takes another form as, "In the discharge of a Leyden Battery. The potential energy lost, is reproduced as heat in the connecting wires, and as heat, light and sound with the disrupting spark." It is affirmed that sound is capable of transformation with light, which has been demonstrated through different processes by Coulon of Rouen, Gentili of Leipzig, and others. Their experiments I have not seen.

In an experiment by Prof. Bell, "when intermittent beams of light were thrown upon an instrument, designed for the purpose, the effect was perfectly startling—the sound was so loud as to be actually painful to the ear placed closely against the end of the hearing tube." That each form of this force is a substantial entity cannot be rationally denied; and that in each different manifestation, the *form* differs as the *quality*; but as the substance of which these are composed is not subject to the laws which govern material things, we conclude that matter, as we recognize it, exists upon a lower plane; and that in some way, the great universal force, of which the various forces of Nature are only partial exhibitions, is the cause of all material things and resides within them as their real substance.

The great important question now is, whence

the source of this energy? We know that Nature herself is dead; all matter is inert. Even if the old dogma were true, that there has been no gain or loss of matter or energy since "the beginning," yet, "as the ultimate transformation of this energy is heat, and this tends to dispersion or dissipation, in which condition it is unavoidable, so far as known, for further transformation, "the question returns: Whence do we procure the supplies of energy which are necessary to maintain the economies of life?" We know that, at present, this supply is from the sun; and comes to us as heat and light, which produce by transformation, directly or indirectly, all the forces of Nature and all the phenomena of terrestrial life. But this influx from the sun cannot produce life itself, and this should lead us to the source whence the sun derives its energy. Not anything devoid of life can move of itself; no motion can originate in material things, because they are in themselves devoid of life.

The life that moves the bodies of animals, and the bodies themselves, are two distinct things, of which one is no part of the other. That which moves is superior to that which is moved; therefore, life in itself must be superior to all physical things; and all the energy of the sun, which is the highest of physical things, must be constantly supplied from this one source. There cannot be two sources; all Nature declares the unity of their origin, in her infinite varieties and co-adaptations. There is but one being who has life in Himself, or is Life itself; that Being is God, "who is the same yesterday to-day and for ever."

This question of supply can never be answered by scientific investigations which depend upon mechanics alone.

All the theories invented for the continuation of the sun's energy, viz: "The condensation of its own substance;" "The impact of falling meteors;" "The return of electric currents," etc., fail to satisfy the inquiring mind in reference to the undiminished endurance of this supply. This question can be answered, only by admitting the transmutation of spiritual substance into natural substance—which is as really a subject of our experience as is the transmutation of natural substance into material substance; as, the conversion of the sun's rays, which is natural substance, into the carbon of the earth and into other material substances; or, the changing of one form of force into another form.

We have, probably, all experienced the transmutation of love, which is a spiritual affection, into heat of the body, which is a natural affection; or the change of a thought which is a spiritual motion, into the motion of the body, which is a natural motion.

Thus the Infinite Life, which is Love itself, flows out through transmutation, and becomes the natural life of all things and the only source of energy. But this natural life comes to us through the sun; therefore, the influx from the Divine into the sun must be constant: "In Him is no variableness nor shadow of turning." This Divine Substance, which is Love itself, proceeding from itself, becomes spiritual substance in which is life; and from this plane, still proceeding lower or outward, terminates in the highest form of natural substance—the

sun or etherial fire, as an effect proceeding from an active cause, and to which it corresponds.

This supply can never fail; the creative energy exists to-day, and is just as active now as when the worlds were created.

Indeed, the creation is a progressive work and is still going on. The same power is exerted; the same influx into Nature continues. The same power sustains that creates.

And as man is the proximate end of creation, he is therefore the *all* of creation. "The spiritual is the real; the physical is but the seeming."

Love, in its outflow does not exhaust itself. The fountain is inexhaustible.

Man, as a spiritual being can reciprocate this love; and thus complete the circuit of creation. The Divine Love draws all to itself.

The relations of God, the Creator, to Man, the creation, are reciprocal. The Divine Love has an equal need for Man, that Man has for God or the Divine Love.

WHAT IS EVOLUTION? WILL DR. McCOSH DEFINE?

BY PROF. I. L. KEPHART, A. M.

Some time ago the eminent head of Princeton College delivered a lecture in Pittsburg, Pa, on Evolution. The *Commercial* of that city reported him as saying, among other things, the following:

"My first position is the certainty of evolution. Evolution is but the coming of one thing out of another. No scientific man under thirty years of age in any country denies it, to my knowledge. To oppose it, is to injure young men. I am at the head of a college where to declare against it would perplex my best students. They would ask me which to give up, science or the Bible.

* * * * *

"Let me warn you that the defenders of religion should be cautious in assailing evolution, unless they tell what they oppose. It is like the other work of God. Evolution, like every other science, is used to expel God and for the degradation of man. I see evolution everywhere in Nature, but I do not agree with Huxley and Tyndall. They use it for the making of infidels. The legitimate evolution supports Christianity.

"I believe that the evolution of new species is a question of science, and not of religion. It should be left to scientific men."

Surely, in the face of the above declarations, the importance of a clear, concise definition of evolution is apparent. When the Dr. declares, as his first proposition, "*the certainty of evolution*," all thinkers become anxious to know what he means. True, in the next sentence, he says, "Evolution is but the coming of one thing out of another;" but that is altogether too vague and indefinite to satisfy the requirements of "the scientific method." Does he mean, with Darwin, that evolution is the coming of one *species* out of another—the coming of man out of the monkey, for example? or does he mean, with Döllinger, Karl Ernst Von Bear, Pander and Louis Agassiz, only the well established scientific *fact*, that "all living beings produce eggs, and that these eggs contain a yolk-substance out of which new beings, *identical with their parents*, are evolved by a succession of gradual changes?"

If, by "evolution," he means this latter, then the whole Christian world says, Amen. The fundamental law of evolution thus defined is a law controlling types within appointed cycles of growth, which revolve ever upon themselves, returning at appointed intervals to the same starting-point, and repeating through a succession of phases the same course. It admits of the improvement of types and of individuals; but it declares that the cycles have never been known to pass into each other—that the "missing link" between species has never been found. The Doctor says, plainly enough, that he does not agree with Tyndall and Huxley; but does he agree with Darwin, that man is but an evolution from the monkey by "survival of the fittest?" Between evolution (development) as believed in by Döllinger and his coadjutors on the one side, and Darwin, Spencer, Tyndall and Huxley on the other, there is "a great gulf fixed," like unto that which is spoken of in Luke vi:26; and the Christian world should know on which side this eminent divine stands.

When he speaks of the *certainty* of evolution, does he mean, with Darwin and Spencer, that all animal life had its origin in the moneron, and that from that mere living atom, by means of "differentiation and survival of the fittest," all species have been evolved? Does he mean this when he says: "No scientific man under thirty years of age, in any country, denies it" (evolution) "to my knowledge?" Surely he should not leave his belief, as to these essential points, in doubt. He knows, or ought to know, that the only scientific *fact* which the Huxley, Hæckel, Darwin, Spencer school of evolutionists has established is the infinity of diversity in the forms of life, each slightly higher than the next below and slightly lower than the next above. Every naturalist knows very well that the tendency of the individual animal or plant to make the least possible rise from its present grade to the next above has never been proved to be one whit greater than its tendency to make the descent to the next lower grade. Of what value in the argument, then, is an eternity of time, until the tendency is *proven* to be either upward or downward? The existence and *direction* of this tendency are as completely unproven now as they were before the above named noted evolutionists were born.

Scientists, so far, have utterly failed to establish the fact that there is a force or tendency in the individual to pass from one grade into another. On the contrary Von Hartman, the leading German Scientist, though an atheist, flatly denies the existence of such a tendency; and if Spencer, Darwin, Tyndall and Huxley anywhere affirm that the existence of such a tendency has been actually proven, I have failed to discover such affirmation. True, their writings, all through, *assume* its existence; but they fail to *assert* its existence as a demonstrated scientific *fact*. But this is a point no more to be *assumed*, than are we to assume that because the plates in a china store are arranged in regular order according to size, therefore the larger ones are mere "evolutions" from the smaller. No scientific work claims to have established this required tendency as a *fact* of scientific observation; and until it is established by actual observation the theory of Darwinian evolution remains an unproved hypothesis.

esis—a mere fashion in science like Descartes' theory of vortices.

The Doctor tells us that "legitimate evolution supports Christianity." What is this "legitimate evolution?" Is it that taught by Spencer and Darwin? He surely knows that when any one speaks of "evolution" without defining his meaning, that Darwinism is understood. When Herbert Spencer was about to return to Europe, Beecher, and other eminent men at the supper given in his honor, declared, as does Dr. McCosh, that "evolution is an established fact of science." Their presence at the supper designed to honor Mr. Spencer, at the time of uttering these words, rendered their meaning sufficiently explicit. They meant "evolution" as taught by Spencer and his school. Not so in the case of Dr. McCosh. His surroundings at Pittsburg were such as to leave his meaning of "evolution" obscure. Hence, the need of a definition.

All evolution that teaches the evolving of a higher species (*e. g.* the horse from the fish—man from the monkey), when traced to its ultimate results, ends in atheism. Does the head of Princeton College teach that kind of evolution? and does that kind of evolution "support Christianity?" If it does, many are anxious to know how.

"The evolution of new species," the Doctor says, "is a question of science and should be left to scientific men." Why, then, does he declare evolution to be a certainty? According to Darwin and his school, "the evolution of species" is the only evolution there is. Evolution as taught by them is an evolution that evolves new species. Is that the evolution that the Dr. so confidently declares is a certainty?

THE LOCUST ARGUMENT.—UNDER WATER.

BY CAPT. R. KELSO CARTER.

In my last article it may have seemed to many, that I hinted at an absurdity in the "drum-skin," portion of Dr. Hall's famous argument. To all who may entertain such an opinion, I can only say that, in my humble estimation, it is an axiomatic truth that, if the air in the four cubic miles is agitated sufficiently to enable a single listener to hear at any point therein by tympanic vibration, it is certainly moved with a force amply sufficient to shake a "drum-skin," in every several cubic inch, *if such drum-skin were present*. But if the figures given in my last may seem modestly to retreat behind those of the *Problem of Human Life*, let the reader carefully note the brazen effrontery with which I herein present an array of figures *considerably* more preposterous than any yet projected upon the unfortunate wave-theorists. In the fashion of Jules Verne, let us take a voyage under the sea.

A number of years ago, a series of very remarkable experiments was tried, upon Lake Geneva, in Switzerland. Messrs. Colladon and Sturm, by means of a bell and some ingenious apparatus, determined, accurately, the velocity of a "sound-wave" through the water. They found that velocity to be 4708 feet per second, which closely agrees with theoretical calculations. But more: They *heard the sound of a bell, struck under water nine miles off,*

clear across the lake. A tin cylinder, closed at one end, was dipped in the lake, and by this the listener heard the bell through nine miles of water the sound traveling at the rate of 4708 feet a second. Without any further delay let us look at the enormous quantity of work performed by this bell, in order to cause every particle of water in nine miles to "perform a short excursion to and fro." Two questions must be answered:

1. What caused the actual motion of the water?

2. How much was actually (not theoretically) moved?

Let us consider the latter. It would be perfectly fair to claim nine miles in every direction, making in all the gross amount of $18 \times 18 \times 18 = 5742$ cubic miles. But I will be ridiculously generous, and throw away all except a mass nine miles long, nine miles broad, and one-fourth of a mile deep. Beyond any question this amount of water, equaling twenty cubic miles, *was actually* thrown into a state of vibration by that single bell; and every single particle in the whole 20 cubic miles, was certainly performing "a small excursion to and fro," or else the wave-theory is *not sound*.^{*} Before I go any further in this, I want every sober advocate of the wave-theory honestly to settle with himself, whether he dare question this statement, viz., That every particle of this twenty cubic miles of water was, and must have been, actually vibrating "to and fro?" This admitted, we are ready to proceed with the funeral procession.

Twenty cubic miles of water contains only 2, 963,959,040,000 cubic feet. One cubic foot of water, weighs actually 62.5 lbs. Hence the total weight of this mass of water is 1,852,479,300,000, 000 lbs. In order that we may pronounce it more easily, we reduce it to tons, and say 926,239, 650,000 tons. Very near one quadrillion tons. Does any body know what that means? Dr. Hall, in *The Problem*, gives the weight of the "drum-skins," that could be loosely placed in four cubic miles of air, at two trillion tons. As I have said, that supposition is entirely correct in every particular; nevertheless no such mass of "drum-skins" ever were moved by any locust. I am hunting solid facts, and inquiring of the wave-theory what *has actually been done*? Whereupon, the wave-theory informs me that the locust really has violently and rapidly shaken a mass of air actually weighing 24,000, 000 tons; and that the bell in Lake Geneva, actually did shake 920 trillion tons. This, for unblushing use of the "long-bow," in pure boasting, transcends the most guileless "yarn," of the simple minded Californian. Nevertheless everybody must—yes, *must* believe it without a particle of discount, or else drop the wave-theory at once and forever. I insist there can be no middle ground here.

But this is not all. The bow draws farther. This twenty cubic miles of water was not only shaken "to and fro," but its particles were shaken at a certain rate. This rate is 4,700 feet per second, or at a velocity *four times greater* than a sound-wave in the air. We have seen that the inertia or *dead-weight resistance* offered by the atmosphere to one square foot of surface moving

^{*}No extra charge for this joke.

through it at the rate of 1,100 feet a second, is 2,800 lbs. But water weighs 770 times as much as air. Hence its resistance to a body moving at the same velocity, or its resistance to *being moved* at this velocity, is $2,800 \times 770 = 2,156,000$ lbs. to the square foot of surface, or cross section. This is 1,128 tons. Again, the velocity of sound in water is four times greater than in air. Resistances increase as the squares of the velocities; hence we have, $1,128 \times 16 = 18,048$ tons. This means that in order to force water to vibrate, "to and fro" at the rate of 4,700 feet per second, a positive dead-weight resistance of 18,048 tons *must be actually overcome* to every square foot of the surface so moved. Further, this was certainly done by the bell in Lake Geneva, *if the wave-theory be true*.

Now let us see how many square feet there are in this case. There are in nine by one-fourth miles, two and one-fourth square miles. This gives, in round numbers, 63,000,000 square feet; multiplying by 18,048, we have about 2,137,000,000,000 tons. *Two trillion tons?* Now this gentle force *was actually* exerted by that bell, four times for every vibration for the particular note given. We will suppose it to be 100 to the second. Then we see that this amount of force was exerted 400 times in the second. (Four times to every complete vibration, because the vibrating body must be started and stopped twice in every complete swing, and it takes exactly the same force to stop as to start in this case.) Why don't the wave-theorists take the contract for running all the factories and motors in the world? It would only be necessary to invent some way of concentrating this force, which is so frightfully wasted every time a sound is produced.

Notice, particularly, that the actual amplitude of the vibration of the water-particles is not of the slightest consequence. The fact remains that these particles moved, and moved *at the rate* specified. We then have the following undeniable facts?

1. This remarkable bell, actually set in vibration, every particle of water in twenty cubic miles.
2. This amount of water weighs 920 trillion tons.
3. The dead-weight resistance offered by this water, to every impulse, amounts to two trillion tons. (This supposes the impulse to be given at the smallest cross section.)
4. This dead weight was positively overcome 400 times in a second, as long as the bell was heard.

Which of these facts will the wave-theorists question first? In connection with the third, I will add, that there is just as much reason to take the largest cross section, $9 \times 9 = 81$ square miles, which would increase the amount to 72 trillion of tons. But there is no use in crowding a man too hard. Still as long as I am in this argument, I mean to push it clear through.

Now it may be objected, indeed it has been, that the sounding body only moves the first layer of air or water, and that the motion of this first layer is communicated or handed over to the next, with some slight loss. As this process progresses the loss increases, until finally

the sound becomes inaudible. Let us look in to this.

1. It makes no difference whatever how thick or how thin, a "first layer" of water be taken. I have taken *no thickness at all*. It is almost a pity to knock the bottom out of an objection so unceremoniously, but it must be done. I repeat, I have not supposed any layer at all. But I have mathematically demonstrated, beyond the possibility of a quibble, that if a prism of water, of the given dimensions nine by nine by one-fourth miles, be caused to vibrate that rapidly, the *impelling body* will experience a dead resistance, equal to two trillion tons.

I have supposed, the impulse given by the bell at the end of the prism, moving a square surface containing two and one-fourth square miles. If it be asked, how thick do I take the first vertical slice, or layer to be? I reply, *no thickness at all*. This sends the objection flying to the winds. It is indisputable that this amount of square *surface* will offer this much resistance. The question of amplitude, or of thickness does not enter the calculation at all. It will be seen that I have carefully avoided giving any such chance for dodging the clear issue. I proceed, in the previous article, upon the simple fact, that when air moves at a certain rate of speed, it develops a certain amount of force. Conversely, when a body moves through the air at that rate of speed, the same amount of force is developed. In the present article we simply substitute water for air, and consider how much resistance it will offer to being moved at a certain rate of speed. The notion that we have to take a certain initial "shell of air," or of water either as the amount first shaken, is in this way altogether avoided. If I had confined my argument to the scale weight of the air, or water moved, the objection might be made, although it would be easy to meet it; but by stepping over upon the ground of the *inertia* of the air and water, I have entirely disarmed all such quibbles. *Let Prof. Comstock, Prof. Goodenow, and others, make a special note of this.* The only questions are:

1. How great is the cross section of the water moved?
 2. How much resistance to such a rate of motion does water offer to the square foot?
- Now, gentlemen, you can make the thickness of the "first layer" as thin as you please. Make it no more than the diameter of an elemental molecule, if you choose. Ah! perhaps that would help you. The space assigned for a single molecule of water, by the writer upon "Atom," in the Encyclopedia Britannica, is not far from $\frac{1}{100,000}$ of an inch. But what of it? It is outside the question altogether. I am not talking about shaking an initial layer of water at all, but about the plain fact that water offers 18,048 tons of resistance, upon every square foot of surface, to any force which causes it to oscillate *at the rate* of 4,700 feet a second. What are you going to do about it?

One other ingenious objection needs to be met conclusively. A friend of mine suggested that the impulse given is simply *transmitted* from one particle to another at the rate of 1,100 or 4,700 feet; and that this is no more absurd than the fact that an impulse given to the one end of a long rod of wood or iron, is transmitted *instantly* to the other end.

This is the feeblest attempt yet. A rod of wood or iron is rigid. When one end is moved by a force, which is sufficient to overcome its inertia, all the rod moves at the same moment. The particles of the wood are already *rigidly in contact*. But in a liquid or gas, the case is very different. These are composed of innumerable particles, which are not rigidly in contact at all. When one particle is pushed by any force it has to move against another particle, and that against the next, till the motion has been handed over *from particle to particle*, clear along the line.

Manifestly this motion can not be more rapid than the first impulse. In the case of the rod, the movement is a *mass* motion; but in the case of air and water, it is *particle* or *molecular* motion. The two cases, hence, are entirely dissimilar. Again, with the rod, every ounce of force expended in the initial impulse or stroke is confined to the rod, and conducted along its length. But in the air, or water, the initial force spreads out equally in all directions.

My friend offered as a proof, that an impulse is transmitted through the air instantly. He said, "When I open my front door, or close it, the door of the kitchen instantly rattles—being moved by the impulse given through the air of the hall, dining-room and kitchen." This is funny. Suppose he tries slamming his front door as violently as possible, and then watches to see the front door of the house across the street rattle. The air in the house *is confined*, just like the air in Biot's tube 3,000 feet long, although of course not so perfectly. In the latter case, Biot heard a slight tap upon the distant end of the tube; but my friend will find it difficult to repeat this through his house. Even a school boy ought to be ashamed of such objections as these, which simply go over the old ground of Tyndall's powder magazine explosion. The impulse of a powerful agitation, a compression of the air, such as is given when millions of cubic feet of gas are instantly created, will travel swiftly of course, but by no means instantaneously. At my own house I have several times observed the difference between the velocities of the shock of the compressed air and the sound itself. I am not far from several large stone quarries, where the blasting is frequent and heavy. Upon one occasion, not long ago, while sitting at dinner, the house was shaken, and I had time to think that the baby had fallen in an adjoining room, then to remember the baby was not there, and then to think of a question to ask my wife, *before the sound was heard*. As I opened my mouth to ask the question the sound of the blast explained matters, and I changed the question into a statement of my thoughts. Of course, these thoughts flashed through my mind very quickly; but the fact was demonstrated, that, at short distances, the shock of a heavy blast travelled decidedly faster than the sound, *precisely as Dr. Hall has claimed*. Repeatedly, when the blasts are lighter, the two occur so near together that I can not tell which arrives first, although frequently convinced that there is a difference in time. In spite of the preposterous absurdity of the claim that a shock and sound will travel exactly together, it does seem as if somebody will have to go to the expense of rigging up a mile or two of gas-pipe and

trying the experiment lately suggested by Dr. Hall. I might claim, however, that the above incident from my own experience has tried it very conclusively. There is every probability, however, that a shock confined in a tube and a similar shock in the open air will travel at decidedly different rates. The former is continually concentrated, while the latter is free to spread in all directions. We thus arrive at the last possible retreat of the wave-theory.

No one can deny the figures given a moment ago. The weight of water stated must be moved many times in a second, if there is any vibration at all; and if there is no vibration, then there are no waves. But some professor, more ingenious than those whose lances have been shivered to atoms against the shield of THE MICROCOSM, may hit upon the following expedient. I always like to do good for my enemies, and therefore, I will offer a much more feasible objection to the locust argument than has yet appeared in print. Suppose you find refuge in Archimedes' Principle?

Whenever pressure is communicated to any liquid or gas, it will be *transmitted equally in all directions*. Now you have a locust, or a bell, in the centre of a cube of fluid matter. The locust kicks, or the bell rings, and at once the force is transmitted equally in all directions. Eureka! the thing is done, and the wave-theory revives. Wait a little. I find another principle as old as Archimedes. It is that any force whatever, which proceeds or radiates from a centre, diminishes as the square of the distance, along any given line. Now suppose the bell, in our case, to move half an inch in each vibration; or say one inch, for greater convenience. Then, the initial impulse given to the water will be one inch in amplitude. Now it is absolutely certain that the molecules of water next the bell will move just one inch; and no one can invent a reason for the next molecule's moving any farther. In fact Tyndall assures us that the actual "excursion to and fro" is *exceedingly small*. He never dreamed of allowing one inch.

We will start with that, however. As it goes on, this force decreases *as the square of the distance*. At 10 inches, it would only be $\frac{1}{100}$, along any one line. At 100 feet it would be $\frac{1}{1440000}$. And at nine miles it would be reduced to $\frac{1}{3240000000000}$ of one inch. But Sir. William Thomson gives the probable size of an ultimate molecule as about $\frac{1}{3200000000}$ of an inch. This remarkable motion would therefore be reduced, in nine miles to less than $\frac{1}{32000}$ of the diameter of an ultimate molecule of hydrogen gas. But Sir. William also informs us that the ordinary vibratory path of a molecule (all molecules are supposed to be in a state of vibratory motion in all substances) is about equal to 200 times its diameter, or to $\frac{1}{1600000}$ of an inch. Now, it is perfectly plain that an impulse to be felt at all by the auditory nerve, must exceed this ordinary vibratory motion of a molecule, which never was heard; whereas we see that it is about *thirty times less*.

But I am growing tired of this thing. Suppose we go into the iron business, for a change. The faintest blow upon a water pipe was readily heard by Biot, in Paris, at a distance of nearly a mile. How far, then, would a weak sound travel in iron before becoming inaudible? We

shudder to think of it, and at what velocity would it travel? Only 17,000 feet a second, or about four times as fast as in water. Iron weighs seven times as much as water, and hence the resistance it offers to a force, moving at the rate of 17,000 feet a second, is about $11,048 \times 7 \times 4 \times 4 = 1,237,376$ tons to the square foot. Yet a pin scratch can be heard through iron, an incredible distance; and surely it could be heard in all directions. But we need not follow this, as it has never been done. The Geneva experiment, however, stands as a great fact. Upon that occasion, a bell actually overcame an inertia amounting to at least two trillion tons, 400 times in a second, or else—or else, the wave-theory is fundamentally wrong in its very essence and conception of facts. If Dr Hall's locust was terrible, what can be said of the Geneva bell? Come gentlemen of the *left*, if we do not properly belong on the *right* of the house, be kind enough to show us our error.

P. A. MIL. ACAD., CHESTER.

THE NEW GIANT vs. THE OLD.—A REPLY TO DR. CRONIN.

BY A. P. BOWIE, M. D.

Notwithstanding the "gratuitous assumption" of the learned author of the new "Prodigal's Return," in the January Microcosm, I still feel able to cope with his diatribe against homœopathy; and neither shall I ask some one else to help defend a cause so beneficent to suffering humanity. No fitter text can be given, to show the present aspect of allopathists toward homœopathy, than Bunyan's description of the Old Giant. He is grown so old and stiff in his joints, that he can do little more than sit in his cave's mouth, grinning at pilgrims as they go by, and biting his nails because he cannot come at them.

The old school, finding out by the success of the new, that heroic measures are not necessary to heal the sick, declare, at this late day, most cases of disease need no medication, and thus account for homœopathic success; and that Nature alone cures. And in the next breath we are told that homœopaths use crude remedies, and the experience at the San Francisco hospital is quoted. But the use of crude doses of opium, quinine, and chloral, is not homœopathic practice, and *they* know it; and neither do we use inert remedies. To be sure, they are harmless, and not poisonous to the well, but healing to the sick, when administered properly.

"Imitate me; but imitate me exactly," said Hahnemann.

Sir John Herschel wrote, years ago: "What torture inflicted on patients might have been dispensed with, had a few simple principles been earlier recognized."

Yes, to-day and for nearly a century, homœopathy has occupied the vanguard in therapeutics.

"Our orthodox friends in the rear have no knowledge of the topography of the region occupied by one army in the van; they remain behind, where we used to be lang syne, and steadfastly refuse to believe we are any where at all." So says Dr. Burnett, of London, in a recent lecture.

But is it true, that the "do nothing" plan of treatment is the best? During the Irish famine of 1847, three classes of hospitals were instituted, with the following results: Allopathic treatment—mortality thirteen per cent. homœopathic treatment, two per cent.; no medicine, but simply cleanliness and good diet, ten per cent. Here the old treatment shows itself to be worse than none, by three per cent. The treatment of an epidemic of typhus fever, by Hahnemann himself, is a prominent instance of this kind—where nearly two hundred patients were treated, without the loss of a single case, at the time when an enormous mortality attended the mode of practice sanctioned by ages. And now, if the allopaths have just found out they can cure without crude drugs, if they want to have better success, let them try the small doses of homœopathy (and as some of them do), according to the *law* of similars, and *not* theory, as Dr. C. asserts.

For homœopathy is founded upon a *law* of cure, and *not* theory. Hahnemann did advance a theory, in regard to the origin of chronic diseases; and although not universally accepted, the experience of many physicians of all schools shows that many chronic cases of disease are the result of skin diseases, driven internally by external treatment, which is the substance of Hahnemann's ideas on the subject. Had I the space, I would like to enlarge on this subject, and present proofs as to its truth. But I must refer those interested to Vol. I., Hahnemann's Chronic Diseases. Should Dr. Cronin ever visit Europe again, I would advise him to look at the statue of Hahnemann, erected in Leipzig, to the memory of Hahnemann and his discovery, where years before he was driven out by the members of his own profession, who received not his doctrine. It is very easy to account for the slow progress homœopathy has made in Europe, for every one knows how they strive to strangle novel doctrines there; but, in spite of all this, there are more physicians practicing homœopathy in Europe to-day than ever before.

The universities and large hospitals are under allopathic control, and that is why homœopathic students are obliged to attend clinics in such institutions and where surgery and other special subjects are taught, and not to feast on the "lean kine" of allopathic therapeutics. I know some who return home and are good homœopaths, and perhaps better for seeing the "husks" which the old school have to feed upon.

And now a few words about the "dear people," as Dr. C. calls them.

Hahnemann first published his discoveries to the profession, but they rejected them; and the people did respond, as they always will and have a right to, for what more important business can engage the attention of mankind, than healing the sick. Here in Free America, more than any other place on earth, homœopathy flourishes because of the character of our republican institutions.

And now, I must close with a quotation from Granvogl's Text-Book on Homœopathy, which I would advise Dr. C. to read when he gets through with his "dime novel" literature. "It is preconceived opinion, it is prejudice, which

has at all times made the whole human race inattentive to facts which ran counter to propositions once accepted, let those facts be ever so abundant and striking. The neglect of an experiment, which might settle a dispute, originates in the fact that we are often more foolish than we think we are."

UNIONTOWN, PA.

AN ESTIMATE OF MILL.

BY PROF. EDWIN R. GRAHAM.

In his introduction to "*Gott und die Natur*," Ulrici remarks that since the days of Kant's famous "Critique," arguments for the existence of God have fallen into disrepute. As a consequence both believers and unbelievers, to a great extent, have come to the conclusion that the existence of God's being does not admit of proof. The former accept His existence as axiomatically true, but incapable of demonstration; the latter regard it as an unjustifiable hypothesis demonstrably false. The tacit acquiescence in the first of these views by a considerable number of eminent theologians, who have ceased to argue for Divine being, has been, on their part, a practical surrender of the claims of theology to rank as a science. While they have been wasting their pulpit eloquence on vain and frivolous points of doctrinal difference, the enemies of Religion have been mercilessly battering down the walls of the temple of truth about their ears. But a reaction has set in, and the being of God is once more demonstrated by the presentation of proofs, clear, strong and convincing. This movement in America was undoubtedly inaugurated by the publication of the "*Problem of Human Life*," with the utter overthrow of the puerile fictions of science before which her votaries had bowed for centuries with uncovered heads. The talented author of that famous book has continued the work in *THE MICROCOSM*, assisted by a brilliant corps of theological writers. These champions of Theism draw the arrows of their warfare not alone from the quiver of Revelation. On the chosen ground of the enemy, they have turned the batteries of science on the foes of their faith, whose confused ranks and disordered array indicate that the final discomfiture, and disaster, and stampede is near at hand; through the noise of the trumpets and the shouting of the captains comes the whisper of the certain promise of victory.

In the modern movements of English religious thought, no careful observer can have failed to notice its Atheistic trend. This has been due to John Stuart Mill in a greater degree, perhaps, than to any other. His coadjutor is Herbert Spencer. To the former was assigned the destruction of Theism, to the latter the construction of an imposing and comprehensive system of Atheism. Since Atheism could rise only on the ruins of Theism, the work of Mill was primary in importance. In himself Mill combined all the elements of the greatest infidel champions, and his attack was indisputably the most serious and dangerous which Christian Theism has ever sustained. The persuasive power of his words was marvelous. Under an exterior of the greatest candor, he concealed the most insidious craft. With wonderful

dexterity he moulded the intricacy of sophistry and the utter confusion of thought into the appearance of clear and polished logic. His opinions were expressed without hesitation, and with an extraordinary show of fairness, and in a tone of supreme confidence such as is born only of a certain and infallible grasp of truth. It is not a matter of wonder, then, that his friends quoted his sayings as the oracles of a perfectly wise mind. The fact that his attack was made in the name of science and philosophy, no doubt, added largely to his influence; and his brilliancy dazzled for a time the thinking men of Great Britain. He was thus enabled for years to control English reason and to leave the deep impression of his individuality on English thought. To a calm and dispassionate observer of the present day, it is incomprehensible, it is incredible that one so crafty and sophistical could have been the recipient of so much laudation as a logician, and that so disingenuous a reasoner could have won so great a reputation for candor and purity of motive. Certain it is, however, that among his worshippers, faith in God was superseded by faith in Mill. After his death, it was boldly asserted that his influence on current thought was undiminished, and that it would be a "national calamity for that influence to become weakened, warped or forgotten."

Mill was stricken down by the hand of death, to whose inexorable conclusion the proud sophist was compelled to bow. The "Three Essays" were received by his friends with surprise, disappointment, and something bordering on irritation. A sense of freedom succeeded his death, and light seemed gradually struggling into the philosophic mind. At last Professor W. Stanley Jevons, of University College, London, uttered his indignant protest against the despotism that had compelled him for twenty years to teach Mill's principles. Better fitted than most other men, he devoted his well equipped mind to the task of untangling the confusion and unraveling the intricate sophistries. At the conclusion of his labor he was compelled to declare that the authority of Mill was productive of a "vast amount of injury to the cause of philosophy and sound intellectual training in England." Jevons justly admitted the persuasive power of his words, and also, unnecessarily, as we believe, his candor and the goodness of his motives. Mill was either uncandid, or illogical. It pains us to assert our belief that he was both. Prof. Jevons believed in his candor, but concluded that he did not add logical accurateness to his other great qualities. His mind was "wrecked" perhaps from the ruthless training of his tender years; perhaps from his life-long effort to reconcile false empirical philosophy with conflicting truth. But from whatever cause, "Mill's mind was essentially illogical." To the consideration of Mill's argument, we shall invite the attention of the reader in a future paper.

FAIRVILLE, MO.

COLD AND HEAT.—REPLY TO DR. HALL.

As the readers of the *THE MICROCOSM* are familiar with what has already been said, no time need be wasted by way of introduction. Dr. Hall assumes that cold is the normal condi-

tion of all things, which saves me the necessity of proving the proposition now—though I shall do so, at another time. His notion that all liquids were ice in the beginning, as their normal condition, is not tenable—as I shall also show at another time. Into the domain of this normal condition of things (or nothings) he thrusts heat as an intruder. Very well. This intruder takes possession of this realm of cold, darkness and silence, (at least a part of it,) and commences to do wonders. How? By radiating itself to death in a vast field of space, and partly so in much of the remainder? for the Doctor admits there is no heat in ice; and what a vast field of ice exists at either pole of the earth; and how much space is heat driven out of—I beg pardon—takes itself out of every winter? What causes heat to do this foolish thing, voluntarily give up its own domain which it had to wrest from cold in the beginning? Can the Doctor tell? Can any one tell, on the theory that cold is nothing? Let him try.

The Doctor properly teaches that the active power of heat is radiation. What is radiation? and what induces it? The Doctor will do well to try his hand at an explanation of this phenomenon on the hypothesis that cold is nothing. But to expedite matters, the explanation will now be given: Radiation is simply the joint efforts of cold and heat to establish equilibrium of temperature. The old theory holds, that it is heat alone that is trying to do this; and as this is all the positive action takes in any way, it looks as though cold, (nothing,) held heat to a wonderful tussle for mastery—or something else. Cold must exist before a single ray of heat can be radiated? for if everything in Nature was at the same exact temperature, radiation would not take place. This is self-evident. Cold is, therefore, the cause of radiation; and not radiation the cause of cold. In this matter, science has "placed the car before the horse."

Now for the explanation of the Doctor's "demonstration" that "cold is nothing." The heated end of a bar of iron is placed in cold water or a snow-bank, and the heat moves from the hot to the cool or cold end of the bar. Of course. What makes it travel thus? If it is thrust into water as hot as itself, will it thus travel? Certainly not. By some sort of *hocus pocus*, then, the cold in the water or snow-bank causes this movement in heat, which is a pretty good feat for nothing to perform. But when the bar is cold, heat does not drive the cold out. Certainly not. Cold was the original occupant, and will not be driven out; for, to submit to this process would be to push itself out at the end away from the fire, and thus make room for the usurper. No such war upon self is found anywhere in Nature, except as a figment of folly in the minds of philosophers (?) who attribute to heat this propensity to self-destruction, elsewhere unknown, accompanied with the property of self-motion, which are both necessarily included in and inseparable from self-radiation. Do you see the point, Doctor? Of course, no one possessing a scintilla of scientific knowledge will claim that nothing can do anything, much less produce the wonderful displays of power in radiation of heat. If cold is nothing, of course it cannot be a factor in this process of radiation; and heat

must radiate itself. No power, energy, or force but intelligent life is self-acting. Heat has neither life nor intelligence. Nevertheless heat takes the cold out of the bar of iron. How? By absorption. Cold is so stubborn it will not be driven out, and so heat persuades it out, as it were. It just takes the cold right up into its own bosom, and after caressing it for a time, lets it go; or perhaps it would be more in accordance with the facts to say, that cold from without comes and demands its own, heat accedes to the demand, and equilibrium is restored.

This is the only rational explanation of the facts; for we know the cold is taken out of the end of the bar in the fire. We know it is not driven out by the heat, as heat is driven out by the cold. How does it get out? Will the Doctor tell us?

This lucid and clearly philosophical explanation of the problem utterly demolishes the conclusive demonstration that "cold is nothing," and proves it to be one of the most potential forces in Nature, and quite adequate to measure strength with heat. The premises gone, all the force is at once taken out of the arguments (or sophistries) based upon the same. I am astonished that, with his keenly analytical mind, the Doctor did not perceive the true solution of the problem; and especially that he did not see that in assuming cold and material ice to be the original condition of things, he gave himself and his theory completely away.

Will the Doctor please tell us how liquids were first made ice? What congealed them? If the radiation of heat now freezes them, or causes them to return to ice, which is the same thing, when and how was this radical change in the *modus operandi* of congelation effected? By radiation, heat melts ice. How can the same act freeze water into ice? Negation, remember, is nothing. Oh, I see! The Doctor says, the action of heat lets the water "return to its normal condition." To return is to act; therefore, the water freezes itself.

As "like produces like," heat can no more produce, or cause cold, directly or indirectly, than a man can beget a monkey, or a monkey an elephant.

The fallacy of comparing darkness, silence, etc., to cold is so conspicuous, as to be manifest on the very face of things. Does the withdrawal of light cause darkness to seem to act, or is the withdrawal of sound apparently followed by noise on the part of silence? Can a body of darkness in the shape of ice or any other form, be transported from night into the blaze of noon-day, and then and there drive out the light around, leaving only darkness or twilight? Can a ton of silence be carried into a vast volume of sound and drown the latter in the depths of its own fathomless sea?

Cold in the shape of ice, is a merchantable commodity, and is transported everywhere. Cold is also employed in the mechanical arts. Who ever heard of darkness or silence being carried about as an article of commerce, or employed in the arts? Until there is some resemblance between them, the comparison cannot be rationally made.

The cooking of meat by heat and cold at the opposite extremes of temperature is not only explained on the theory of two forces, but

furnishes a conclusive proof of the correctness of that theory. Cold *drives* out the particles, which are extracted in the process, while heat absorbs them. Hence the water in which meat has been boiled, is impregnated with the particles absorbed into it by heat. But who ever found a sediment, or anything like it in the cold, which has done the cooking, or any of its environments. Cold *preserves*, heat *destroys* or disintegrates. When death is caused by cold, the body is preserved indefinitely, while perfectly retained by cold. But when heat takes life, if in the shape of fire, it consumes, or partly consumes the body; if by other means, decomposition immediately takes place, unless arrested by cold or some analagous process. So radical differences might be pointed out indefinitely, but these will suffice for the present.

On the basis of two forces, every phenomenon attendant upon the action of cold and heat can be philosophically explained and elucidated; but I challenge Dr. Hall, or any other person on God's footstool, to write two pages for the THE MICROCOSM on the old theory, going into the merits of the subject and touching the essential principles involved, without self-stultification or inextricable entanglement. The old theory is radically erroneous, and cannot be successfully maintained.

Dr. Hall will do well to explain what he means by God being *abnormal*? Also, how the normal condition of universal space is perfect vacuum, "and yet the whole universe" "pervaded by the *substance*" of God. Many other points present themselves; but I forbear pressing them, as they are not essential to the real issue involved in the discussion.

OSKALOOSA, KANSAS.

THEORY OF CREATION.—No. 1.

BY ELD. J. J. MILES.

True science first observes phenomena and ascertains facts, and second, adopts that theory which comes nearest to accounting for the phenomena or facts without contradicting any one known fact. On this ground I accept Substantialism as truly scientific.

According to the Bible, God is a spirit, and God created the heavens and the earth. Somehow or some way, then, the heavens and the earth originated in spirit. Now say that mind is substance, and that thoughts which the mind puts forth are substantial, are there any *observed phenomena* and *known facts* which go to prove that God might have created the universe of mind and matter out of His own mind or substance? This question I will try to answer.

Says Paul, "We are His offspring." Like father, like son. The moon has no light in and of itself, but receives it from the sun. Hence whatever characteristic we find in the moon's light, certainly exists in that of the sun. Whatever attribute or power man's mind is possessed of, God's mind certainly possesses, since man's mind is derived from God. He may have more attributes or powers, but certainly cannot have less.

Now we can observe the phenomena of man's mind, and thus know something of the nature

of the Father-mind. In sleep, in certain states of the nervous system, in mania potia and in insanity, man's mind creates a world of its own, a land of dreams or an imaginary world, we call it. Man sees, hears, tastes, touches, smells, objects, nay converses with living beings who talk to him and express thoughts, speak words which he most distinctly hears. All this is the creation of his own mind, very evanescent it is true, yet as real to him for the time being as the God-created world we all inhabit. I will assume that these creations of man's mind, though not material, are substantial. Why not? Does not this theory perfectly account for these phenomena? To the dreamer or insane man the world he inhabits for the time being and persons he converses with actually exist, a most vivid reality to him. Some power or being created that world and its inhabitants, or it could not exist. If we say that God created it, then it follows that men have frequent intercourse in our day with God-created spirits, and that there are God-created lands of dreams for every dreamer, and that the insane inhabit a God-made world suited to their frenzied state, and that God creates a literal hell and thrusts the drunkard in delirium tremens into it! I could as soon believe in ghosts and witchcraft, as this.

If you say it is all unsubstantial, unreal, but only phenomena of mind, I ask you to account for the phenomena. When you have accounted for them possibly you have accounted for all creation. If seeing, hearing, touching, etc., a world and inhabitants can exist to a dreamer or insane man and yet have no *substantial* existence, why may not the universe exist in the same way and on the same principal? But you reply, a man is *conscious* of his own substantial existence, so that each man's consciousness gives the lie to the theory that the universe is not substantial. You reason rightly. Well, then, since we have the same phenomena of seeing, hearing, etc., a world and beings who talk with us in dreams and insanity, &c., let us account for these phenomena by the same theory *we know to be true in the one case*, and say that the world of dreams and insanity with its inhabitants is also substantial, though not material. Indeed the insane man, or he with delirium tremens, is just as *conscious* of seeing, hearing, feeling, etc., conversing with beings who talk with him, as he is conscious of his existence. You may call that world, these beings, unsubstantial; yet it remains that the man does see, hear, etc., and that those beings do exist to him, and that he is *conscious* of the phenomena. Why, then, say that the phenomena are unsubstantial, but that the mind of the man is substantial? I am aware one may quibble over that word "consciousness;" but drop the word, it still remains the man is as certain that he sees and hears and converses with beings (substantial or unsubstantial) as he is certain that he exists at all.

We rest then, on this as the probably true and scientific theory, namely: Man is finite in his powers, God is infinite. Man's mind and its powers are derived from God. Whatever powers we find in man's mind, God possesses the same to an infinitely greater degree. Man's mind has the power to create a world, people that world

with living beings, who think, act, converse, though that world with its people are *very evanescent* and are absorbed back again by the mind very speedily. God's mind, on the same theory, has infinite power to create worlds at will, people those worlds, and make them all lasting, abiding. This theory accords with the Bible statement that God, who is Spirit, created the heavens and the earth; that He did this of or out of Himself, and avoids the positively unthinkable idea of something being created out of nothing. And if this theory, carried to the extent we have carried it, seems passing strange, incredible, it is no more strange than the idea of the earth's turning round was to the people in Galileo's day, contradicting their very senses;—no more incredible than that millions of living creatures may inhabit one drop of blood. And to my mind it is not strange at all when compared with the monstrous theory that star-dust becomes the grand system of worlds constituting the universe, and becomes inhabitants endowed with power of thought, all by virtue of some energy inherent in star-dust itself alone without any intelligent creator.

And our theory may account for much that is claimed by spiritualists in our day. What if the spirits they see, hear, call up, etc., be creations of their own brains? What reliance can we place on the communications of these spirits? The first thing to settle before we set any value on their messages is, what kind of spirits are they? If not demons, still are they God-created, or the mere creations of an excited, disordered mind?

Our theory of creation shows that God may create worlds, etc., out of His own substance, those worlds be dependent on Him for continued existence, and yet God not be confounded with His creation. Dreamland is not the dreamer, though it is his creation.

CLINTON, ILL.

THE OPPOSERS OF SUBSTANTIALISM.

BY PROF. R. D. MILLER.

Editor MICROCOSM.—*Dear Sir*—I wish to say a few words to your readers, especially to such—if there be any—as are opposed to "Substantialism."

I read the *Problem*, when first published, and have carefully perused every number of THE MICROCOSM up to the present, and am frank to confess my acceptance of the fundamental principles of Substantialism as there presented. True, there are some minor matters, or side questions, in which I do not fully agree with you; but the great principles of your theory are so fully in accord with Revelation, the disclosures of Nature, and the demands of reason that, to my mind, there is left no ground upon which to base an objection. Substantialism is so in harmony with the teachings of the Bible, Nature, and Reason, in respect to the being and attributes of God, man's responsibility, and immortal constitution, and presents the hopes and prospects of the Christian in such a clear and tangible form, that I can but accept it with deep thankfulness to God. But I am constantly thrown in contact with men, who are most bitter and violent in their denunciation of both the "Theory" and its "Author." Many of

these are Christian men, who claim to be fully up with the advance of science. I do not pretend to be a *scientist*, or to be up with the advancements of the age; but I feel that I have a right to my own opinion upon every subject that addresses itself to our reason.

I have found among the opposers of Substantialism some, who, when tested, have given positive proof that they have never read, or have never *understood*, the position you take; I am fearful that many are in this condition. Another trouble is, that there are so many who aspire to a *name*—a reputation for scholarly attainments—but are not possessed of sufficient independency of thought to investigate for themselves, but who cringingly adhere to any old fossil idea, no matter how unreasonable or absurd, if it is only popularly accepted.

Take, for example, the old orthodox idea of immaterial spiritual being. I ask the readers of THE MICROCOSM, especially the opposers of Substantialism, if there be any such—if this conception is not vague and unsatisfactory? Spirit, as thus conceived, cannot have form, or locality, or properties—in fact is even more unreal, and unthinkable than absolute *space*. This idea of spirit is a blank, and is a perfect synonym with nonentity. Yet many intelligent men are afraid to accept any other system, no matter how reasonable, because the current one is popular, and rendered venerable by age. This has ever been a barrier in the way of the advance of true religion. We have clung to old myths and superstitions and visionary absurdities, feeling it to be a sacrilege to allow our better *reason* to suggest a thought—our boasted future being an absolute blank, and our immortal home an unreal and unimaginable emptiness—until the world has almost come to regard the whole system of Revelation as a myth and a cheat. Why may we not accept the *truth* that "there is a natural body, and *there is a spiritual body*," and that "in our Father's house there are many mansions," and that Christ has *gone* to prepare a *place* for us, that *where He is, there we may be* also?

But with many opposers, the great trouble is, the precious wave-theory of sound. Surely, no one can intelligently understand the facts of the phenomena of sound as illustrated constantly around them, or read and understand the contradictions, and absurdities in which Prof. Tyndall & Co., are involved by their own illustrations and experiments, and not be inwardly convinced of the absurdity of this whole theory of *sound-waves*. The system is directly in the face of the known laws governing matter, and no vagary was ever presented that is more grossly absurd than some of the accepted *scientific* explanations of the phenomena of sound. Here is Mr. A. who cannot believe the "Substantial," theory. O! no; it is too absurd; but he can easily believe that if I place my ear to one end of a bar of chilled steel, ten feet long and so hard that no file will touch it, and if some one gently passes the silky ball of a finger over the other end of the bar, that this soft touch starts the molecules of the steel to vibrating, and this vibration is communicated from one molecule to another clear through the bar, and that these vibrations are sufficiently strong to set the *air* in my *outer ear* into vibration, and this moves the tympanum, and this in turn, vi-

brates the hammer, and this the anvil, and this the stirrup, and this "shakes up" the sack, and bristles, and at last the proper chord in the little harp is struck, and I hear the sound? O! yes, all this is *science*, sound *philosophy*, and no one but a "crank, or an ignoramus" can doubt it?

They readily believe the theory of Prof. Tyndall, by which he so lucidly explains the communication of the tones of the eighty-five strings of a piano through a rod of deal half an inch in diameter." It is all simple, that while two waves of different lengths cannot exist in the same substance at the same time;—yet it is plain and simple, that the waves from these eighty-five wires, all differing in length, are carried ten or even more at once along this half inch rod; and though thus carried, and then broken and disturbed by numerous objects in the room, still each one distinct and clear, unmixed and unconfused, passes through the tympanum, and bones and sack, and never fails to strike the proper string in the little harp. Was there ever a greater insult offered to human credulity, than to ask us to accept this?

No, Mr. Editor, to my mind one of two things must be true; these men have not understandingly read up on the matter, or else they are of a *turn of mind* that *will* not be convinced by any amount or degree of proof. Instead of crying "ignorance," "egotism," etc., why do they not meet, at least some of the points you make? I am heartily sick of this croaking, especially from these "lesser lights," swinging on, blindly, to the coat-tails of admired *leaders*.

Ignorant as I am, I would love to investigate some of these matters, in a public oral discussion with some of those, nearly as small as I am, if they can be found.

Go on, Doctor, in your work for *truth* and *Revelation*. You will be opposed by a large class of men, who have become fossilized in their ideas; but there is a host—a mighty army of *young* men, who can and will get out of the old ruts, in spite of college professors and stereotyped errors; these are now drilling for the fray, and victory for *truth* is sure to be gained. Work on, and your reward will be the gratitude of good men here, and a crown of life hereafter.

PETERSBURG, LLL.

LAW.

BY J. R. HOFFER, ESQ.,

No law, whether of spirit or matter, of God or man, has of itself the power that can put it in force, any more than has a machine or tool the power of operating itself. Laws are but the instruments or machinery through which the actual forces or powers have consistent action. All laws are lifeless, yet there can be no effectual action without law. Forces are of life, not of law; and life in its essence is mind, consisting of will to act, and understanding to direct. Law is, therefore, the understanding, for it directs; hence it is also of life from which all things are.

Action which has no tangible or known vital connection with life or mind, as has the body of a plant or man, is generally recognized as

law; yet it is not law that acts, but force by law. The operations of or through the laws of Nature are not merely mechanical; but like that of a tool in the hands of a skilled mechanic, they are made to produce results which would be impossible for unconscious forces, mechanically acting. As for instance: gravity and the laws called centrifugal and centripetal forces, to which are ascribed the movements of the heavenly bodies, could not have put these bodies in motion. And, admitting that the Higher Power did start them "in the beginning," they do not now travel consistently with these laws, which would cause them to move in circular orbits, with the source of attraction, the sun, in the centre. And if there were even no substance in inter-stellar space that could cause the least friction or resistance to the speed of these orbs, gravity, or the centripetal force, which it is supposed so checks the diagonal flight of the planets, as to cause them to move around the sun, could gradually reduce their speed, and finally pull them into the sun. And the moons which roll around some of these flying planets, would be in a still worse predicament between the attraction of their primaries and the sun, were there not a conscious and wise direction of these apparently blind forces.

Again; if the moon's attraction were but a dead pull, it could not cause the tide to swell on opposite sides of the earth at the same time. So in crystalization, capillary attraction, and in every phenomenon in Nature, are many conditions which an unconscious force, undirected, could not produce. It would indeed be laughable to hear a person persistently ascribe the forming of a beautiful statue, out of a rough piece of marble, to the accidental hopping and turning of a chisel, and to find that he absolutely refuses to recognize the hands that hold and strike the chisel. Yet it is orthodox science to persist in ascribing all operations and phenomena in Nature to unconscious, powerless, and, in themselves, dead laws or tools, and to refuse to recognize the manipulation of them in all their actions, by the living, omnipotent, all-loving and omniscient God.

A person does, indeed, well in believing that there is a living God who has planned and created the universe, and instituted the forces and laws which therein operate; but there surely is a closer and more intimate relation than this between God and His works. He, not the forces and laws by Him instituted, "clothe the lilies of the field;" and "the very hairs of your head are all numbered," not by these unconscious laws or forces, but by Him who "maketh His sun to rise, and sendeth rain," and Who is not a mere law or force but Life itself.

Recognizing that nothing can exist but what God produces and constantly maintains, we cannot fail to see that His providence must be most particular—so that every iota of what here appears as force or law is sent forth upon a special mission from which it cannot be diverted. Instead of any forces being fixed or stationed in Nature, and here manipulated by God, which would require His personal presence, they must be constantly sent forth from Him; for in no other way could everything in Nature have His constant attention. Gravity and cohesion (more properly selection) which are so much like love and wisdom in their ac

tion, and which permeate all matter and space, are therefore, instrumentalities constantly extended from the I AM.

Does it seem to be impossible for the Infinite to attend to all these things in the grand universe, or even on the earth, or in one human being? To absolutely unlimited power it is as easy to do billions of things at the same time, as one; to create a world, as a grain of sand. In God is nothing that resists or dissents, and outside of Him is nothing but what He makes and keeps in existence; therefore, His power is unlimited. And yet He cannot change, or do anything in two ways; for His perfection is also infinite, and nothing can be in two ways absolutely perfect.

In being unchangeable and unyielding, God's operations in Nature have the appearance of law. But unless we recognize His constant attention to the least and the greatest, as the only cause of their continued existence, we come very far short of a proper appreciation of God, or of finite things. And comprehending this, it appears clearly that the extension of these laws and forces must be infinitely constant and explicit; and that a law, however simple it may be, if mechanically enforced as a whole, would have a blind and unconscious action that may well be called chance. With the Infinite, all is Providence. But to the man who does not recognize the living God, all is chance or accident. He has no assurance that even the natural forces will continue unchanged.

Mount Joy, Pa.

THE WAVE-THEORY OF SOUND—IMMORTALITY.

[From the *Christian-Evangelist*, St. Louis.]

BY ELD. THOS. MUNNELL, A. M.

Seldom has any controversy, in scientific circles, created a sensation equal to that concerning the wave-theory of sound. *THE MICROCOSM*, edited by Dr. A. Wilford Hall, of New York, has been the assailant of this twenty-five hundred year old doctrine that sound consists in waves or undulations of the air. The attack was sudden, fierce, and unrelenting; and supported by a cloud of scientific facts that was little looked for, even by the greatest advocates of the wave-theory. *THE MICROCOSM* holds to the corpuscular theory—that sound consists in "substantial pulses" projected through the air as also through all solid matter by a law of conduction peculiar to itself, similar perhaps to that of electricity on the wire. Many learned professors and distinguished scientists have tried to measure arms with the stout editor, but with what success the following account of results of the contest on a few of the main points of controversy will show:

As *THE MICROCOSM* is a religio-scientific periodical, the reader may ask what difference does it make to religion, which theory is true? This will be understood when we remember that scientific materialists contend that *thought* or *mind* consists in mere molecular motion—motion of the molecules of the brain,—and that when death comes and all molecular motion ceases, *thought* ceases. If, then, there is no thought after death, there is no soul, no spirit, no immortality. Now to destroy this plausible

philosophy, Dr. Hall demonstrates, by arguments that never have been met, that sound is not mere motion of the air, but a *substance*—that light, heat, electricity, gravitation, life, thought and spirit, are all substantial entities,—things that exist,—and not mere modes of motion. If outside objects, addressed to the senses, start this supposed molecular motion in the brain, and should death cause such agitation to cease, then all thought and future consciousness cease also *provided* thought is produced only by said motion. But the same men that contend for this, contend also that sound is merely motion, consisting of air-motions as thought does of molecular motions; and if the wave-theory of sound can be demolished, it will destroy public confidence in the infallibility of skeptical scientists, and will go a long way not only to prove that sound is a substantial entity, but that thought also is not a mere mode of motion that will die forever, and as soon as agitation of the brain from without shall cease. This makes every believer in the immortality of the soul, and especially every minister of the Gospel, profoundly interested in *THE MICROCOSM*'s fight against Materialism.

My remaining space will allow me only to state, and that very briefly, a few of the leading arguments against the wave-theory of sound:

1. As sound is supposed to be carried through the air on waves similar to water-waves on the surface of a pond, of course there can be no sound where there is no such agitation of the air. If you hear a voice a mile distant, of course the air must be agitated at least one mile in that direction; but if in one direction it must be in all directions, the distance of a mile, including a mile high. This would make four cubic miles. Now the weight of four cubic miles of air is 20,000,000 tons, and the voice that is heard throughout said space must be able, according to the wave-theory, to throw all this weight of air into agitation sufficient to produce waves all through and through it, about the same time. Now, it is found that a certain locust can be heard on a calm evening at least one mile in any direction, or through four cubic miles of air. That is, this insect can, by scraping its wings upon its legs, shake four cubic miles of air, weighing 20,000,000 tons by the mechanical energy of its little body. And yet, if no sound can be produced without an air-wave, this is what the locust must do to be heard. The key on which said locust sounds its notes requires 440 vibrations in a second, and of course, he must drive that number of wavelets through the four cubic miles of air every second. Some have tried to laugh down this argument, but it is remarkable how little has been done to defeat it. Most of its opposers have just quietly subsided, and left their favorite theory in the unyielding grip of Dr. Hall, who now-a-days fails to provoke an attack upon this stubborn problem.

2. The editor next attacks the doctrine of sound-interference as producing silence. It is held by Prof. Tyndall and all scientists that a proof of the wave-theory is found in the fact that if you place two unison tuning-forks or other sounding instruments a half wave-length apart, so that the crest of one wave will fall into the trough of the other, silence will be pro-

duced. As two water-waves so meeting would produce a level or smooth surface of water, so two air-waves so interlacing would destroy the air-waves of course, and shut off all possibility of sound. This whole doctrine of interference, Dr. Hall has proved, by the most telling experiments, to be a mere hoax. I have not space here to even hint at his process of experimenting and reasoning; but whoever will read up the discussion in *THE MICROCOSM*, during the last year and in the *Problem of Human Life* will see that he has taken that goose by the neck in such a way that no one feels willing to come to the rescue.

3. It is found by oft-repeated experiments that sound will travel through water as a medium four times faster than through the air—4,480 feet in a second. Now suppose a concussion of two hammers were made ten feet under the surface of a lake, is it likely that waves would be started at the rate of 4,480 feet in a second to constitute the sound through the water? Must we believe that there would be any waves? If not, how could sound be produced under the water at all on the old theory? But a still more damaging fact is, that sound is conducted through iron seventeen times faster than through air, or 19,040 feet in a second. Does the tap of a hammer or the scratch of a shingle-nail on the end of a bar of iron throw the whole bar into undulations, and so drive the sound at that rate? Suppose a bar to be 1,020 feet long and a stroke be made on one end, the sound would reach the other end by the time an air sound would be going sixty feet. And if all sound is made up of waves, and we cannot conceive of iron waves at all, what becomes of the wave-theory?

4. We have room only for another of the many invincible proofs against the wave-theory, and we will refer intelligent readers to the works above named for the numberless and telling points made to the same effect, of which these four are mere specimens. As sound-waves are said to be produced by the swift motions of the vocal chords, piano-strings, tuning-forks and other such instruments, these motions, it is admitted, must be sufficiently swift to condense the air ahead of every stroke and to leave it rarefied behind. As sound travels at the rate of 1,120 feet per second, the wave must travel at precisely the same rate; for the waves constitute the sound. The motion of the piano-string, therefore, must be very swift, or it could not start the waves at that rate. But here the troublesome editor of *THE MICROCOSM* comes in, and by simple experiments with a tuning-fork proves that sounds are actually produced when it has so nearly ceased to vibrate that its entire motion both ways all added together, is not more than at the rate of one inch in two years, or 25,000 times slower than the hour-hand of a clock! This Mr. Hall calls his "final demonstration" against the wave-theory; for if a tuning-fork can be heard still sounding, at the end of a tube, when all its vibrations each way added together make only this rate of motion, of course its sound is not generated by its rapidly producing condensations and rarefactions of the air at the rate of 1,120 feet per second. And I feel sure that in no way could I interest the reader so intensely as by closing this article with a brief

extract from the October *Microcosm*, giving Mr. Hall's description of the experiment by which he demonstrates this almost incredible statement:

[See the original demonstration in the October *Microcosm*, 1883, and Capt. Carter's extension of it in his Report in the December number following. Mr. Munnell then concludes his paper in these words:]

"Therefore, the wave-theory is not true; and the scientists who hold that mind as well as sound is a mere mode of motion are at a heavy discount as to the question of acoustics, and are still less reliable as to the immortality of man."

[P. S.—Since the above article appeared in the *Christian Evangelist*, the portion of it relating to the locust-problem has been copied into the *Christian Standard*, of Cincinnati, Ohio, and an attempt made to weaken its force by an editorial writer on the staff of that paper. The criticism, however, is surprisingly weak as a pure misapprehension, and the points raised correspondingly frivolous. Thomas Munnell has sent a most searching critical reply to the *Standard*, answering its attack and meeting every imaginary difficulty it suggests, besides placing the fundamental principles of Substantialism on a stronger foundation than ever before. That reply will be copied into next month's *Microcosm*.—EDITOR.]

DOES MIND EXIST IN MAN?

BY HON. B. J. PENGRA.

In a new work just from the press, entitled "Insanity in its Medico-Legal Relations," by T. R. Buckham, A. M., M. D., on page 37, will be found a quotation from the great Philosopher Herbert Spencer, "on the subject of mind." Following the quotation, on page 38, is a statement, by the author (Buckham) as follows: "What the mind is, we don't know; but startling as the admission may appear to those who have not given the subject close attention, the statement that we have *no direct or primary evidence that we possess a mind at all*, will be more surprising—yet such is the fact."

The conclusions embodied in the foregoing italicised hypothesis, are not new; and in this instance, are quite similar to those of Spencer, as given in the quotation to which we refer. But for the reason that, with Spencer, the error with him seems to arise out of one of greater magnitude, which is projected upon the world in his "Philosophy"—that we propose to discuss at some more favorable time. We don't give the quotation here.

I propose in this paper to discuss the proposition of the author, as given in italics above. The question of *primary existence* of the mind, and not that of *what the mind is*.

If it be true, as affirmed, that there is *no primary evidence of mind in man*, that we are destitute of any evidence but what is recognized as the outward operation and results of mind; then how are we to know that man possesses any mind, except as other animals? How are we to know, that what we recognize as the intellectual action of mind, of an order far above the instinctive action, is not action of

antecedent cause through man's physical organism? Such an hypothesis already exists in the minds of many.

That hypothesis, if true, would place man outside and beyond the reach of responsibility, and put in his stead the power which is responsible for the antecedent cause. Existence of mind in man as a real thing, composed either of attributes or otherwise, would be that of which we take cognition as "primary evidence." The action would be secondary, and results final, evidence. To say, therefore, that there is no primary or direct evidence, is, in this case, to say *there is no mind*. These authors, with the world of mankind at large, have accepted the latter evidences, actions and results, as evidences of mind in man. If this evidence is reliable in its order, then what shall we say of the abstract reason? Nay, more, what of the philosophy which affirms, that notwithstanding these evidences, yet there is *no direct and primary evidence of mind*? What would become of the author's case in court, with his witness, and himself at the head, testifying as to certain acts of insanity, and their results—but when called upon to answer as to the *source of action*,—from which action and results proceeded,—he should answer, that the source of action was non-existent, or that there was no evidence, that it did now exist, or ever had existed. This statement of the case, shows conclusively, that the view of the author is defective, in the sense that it is unphilosophic, unscientific—at war with metaphysical abstract reasoning, and untrue in fact.

The defect is not an affirmation by the author and Spencer, that there is no mind entity in man in so many words—for both concede, and argue from the assumption that there is. It seems to arise out of an imperfect conception of the nature of primary evidence. No argument is made to sustain this view, and charity requires that we take it for granted, that these authors have to the present only been able to take cognition of the operations of mind, and the *results*, which are the secondary and final evidences of existence. The existence of mind in man, is both actual and potential. The actual passing into potential, is evidence of inherent power to act; and not of antecedent cause, as might be inferred from Spencer. The operation of mind, is cause itself. The cause of results: The *antecedent cause*, was that cause which brought forth and *entitled the mind*. Laying back of the *antecedent cause*—is the absolute and unconditioned potential existence possessing absolute and unconditioned *inherent* power, which, operating as cause, brought forth and entitled all conditioned existence, with man the ruler, at the head, a perfect type of himself, and by which he is to be known. And for one, I take courage, and thank God, that I am a type of the "I AM," and that man's is a responsible existence.

What is "direct primary evidence" of mind? There can be but one answer—it is the mind itself in all its parts; and if we are able to take cognition of it, it must be by other means than the five senses of smelling, taste, feeling, hearing and seeing—for they are not relative as attributes of mind, and the consciousness which arises from them is only relative as in-

telligence. That which we recognize as mind in man, and as being an inherent of existence, is subjective existence, and must like the lower, or instinctive being, possess and be known by its attributes. If such exist, they exist as *functions*, which, when taken together, constitute the entity known as mind, and are each and all direct and primary evidence of existence of mind. The mind like the lower order of consciousness is possessed of five attributes, or functions. They are Faith, Hope, Love, Charity, and Justice. These attributes are not forms of thought; for were they such, they could not be thought of—since it is impossible, according to Spencer "for any thing to be at once the form of thought, and matter of thought." These functions are the source of consciousness, and produce action, or cause. They are relative, one to the other, and the manifestations of mind which follows. They are subjective functions of the Ego! Yes, they are the conscious Ego—and to them is given the command to govern with faith, and hope of success. Govern with justice; Govern in Love; Govern with Charity; and to keep in subjection the unruly members of the body—otherwise governed only by the animal faculties of instinct.

And, again, the mind in a strictly analytical sense, to be thought of at all, must be thought of as a thing of conditions, or attributes. It could not otherwise be comprehended in thought. To posit an alternate theory, is to multiply irrationalities, impossible to realize—and our consciousness of their subjective reality is positively insurmountable.

To assume that *conditioned being exists*, and deny that there is primary evidence of the existence of the one most essential condition, is to deny what is assumed. To say that a thing is known to exist by the operation of certain causes which produce results, and then affirm that there is no primary evidence of the existence of that which produced the cause of result, is to affirm that cause exists by spontaneity, or, as in this case, leave the author in the dilemma of assuming that cause and effect are mind, or that there is no mind. If the latter, then cause and effect are nothing, and we have two nothings, in the place of one something; precisely the reverse of this is true. The monuments of earth, physical, and intellectual which have been, which are, and are being builded, are mementoes of the mind of man. In him, it has ever existed, with inherent power to *cause*, and in every result is seen that which first was imaged on the mind as a conception before it was entitled in form or in language. I therefore point the reader and author to the attributes, each one being a fundamental verity, as that of which the mind is constituted and say, behold the primary evidence? Oh! says the author, "this is precisely what we have said we cannot do." We can neither feel, taste, smell, hear, nor "behold" the mind. Why, my dear sir, is that so? What is the operation of sight but the conscious perception of the objection on which it is directed? Is this our only perception? Is it, because we see with the *eye* only the results of the operation of mind, that we derive a consciousness of its existence? Why! the dog, the horse, and every being belonging to the animal kingdom have eyes, and see like

wise; and they possess the five instinctive attributes, and what do they know of mind? What cities have they builded? What hope, what justice, what charity, what love, and what faith have they manifested? Have we no other perception from which consciousness is derived but the five senses. Any theory of the mind which takes no account of these attributes of mind, must of necessity be extremely defective.

As a question in philosophy and science, we are called on to say what they are; and we cannot decline the task, without confessing our philosophy to be incompetent. Philosophy, when complete, is the expressed harmony of all truth; and complete science will take cognition, both of the conditioned and unconditioned truths.

As these functions do exist, and the mind is able to perceive the fact, and that there is no mental action, except as stimulated by them, no other conclusion can be arrived at but the one herein set down. Destroy, or take away the five senses, and what becomes of animal-life?

Take these five functions, or attributes from man, and what becomes of the intellect. No hope in life, no faith in success, no love for self or the race, no charity for the distressed, no justice—and man has no knowledge above the brute. He knows no God. In Him, he has no *faith*, no *hope*; and for Him no love, and of Him no consciousness.

But to continue the analysis, from the author's standpoint—"no primary evidence of mind." We answer, that cause cannot be conceived of as absolute, but that which is necessitated by something beyond itself. The act of causation, is of necessity voluntary. Volition is only possible, in conscious being. To suppose conscious being can be represented as nothing, involves two absurdities—that nothing is more than negation, and can be positively represented in thought; and that this nothing, may be distinguished from all other nothings, by its power to develop into something. And Spencer says, "We have no state of consciousness, answering to the words—an inherent necessity, by which potential existence becomes actual existence." We must therefore, conclude, that the mind is a real entity in man and not a fiction.

But what is faith, hope, charity, love and justice, to the intellectual man? Do they in any sense exist as faculties of mind. If so, then but one of two hypotheses can be correct, respecting them. Either that they exist objectively, or subjectively.

If the first, then they are external to, and independant of ourselves. If we consider them in this light, what becomes of them under analysis? To say they are objective, is to affirm that they are independent *entities*. To say that they are non-entities, is to defeat the hypothesis; for non-entities are non-existent. And to affirm that non-existence exists objectively, is a contradiction of terms. And moreover to deny that they are things, and so by implication call them nothings, involves the absurdity that there are five kinds of nothing. We have no choice left us, therefore, but to recognize them as subjective attributes of mind; for we have no power to think of them as disappearing from consciousness, and for the further reason that

we cannot think of anything at all which belongs to conditioned existence, except as something having attributes. The reason of this is that our power of conception—the mind—is *conditioned power*, and we distinguish something from nothing, only by the power which the something has to act in our consciousness. In this case, it is the several effects which the attributes produce—called consciousness. The absence of these faculties would be the absence of that which involves consciousness in the mind. And if this was so, there would have been no ground for, and no discussion of, the subject of insanity by the author.

The lower order of consciousness takes no cognition whatever of the state of insanity—cognition of this state of the mind, is by the mind. And as to this, we are gravely told, by the author, "that there is no primary evidence of its existence."

There is a relativity existing between all conditions of knowledge which, for the reason that we only aim to show primary existence of mind, need not be discussed. But though this actual relationship in knowledge exists, yet attributes of mind, and attributes of instinctive consciousness, are not relative to each other, in any sense, except as to the fact that they are each a source of consciousness, but, of entirely different orders of consciousness. As well might we ask to see the mind of absolute Being, with the eye, as to see the mind in man. This is not because the eye cannot see, but because perception by the sight of the eye is non-relative to the perception of the attributes of faith, etc. Perception by the eye, is perception of form. Perception by the mind, is perception of the meaning of form, as well as form; and the difficulty which has lain in the way of perception of mind, is not only because the mind is not tangible as physical entity to the lower order of perception, but for the further reason, that in us, the only power we possess, with which to take cognition of the mind, is by the mind itself. The mind must see itself in its attributes, or we can have no consciousness of its existence; and even this would be beyond our power, were it not that it is made up of constituent parts. The five attributes of animal consciousness, as *perceived by the mind of man*, are the primary evidence of animal consciousness. Their action in operation is *secondary*, the results of action is the final evidence of their existence and inherent power. Precisely the same order is true of the mind. The five attributes which constitute the mind, are the primary evidence of existence; the action of mind is secondary, and the results of action final evidence of existence of mind. Destroy or take away the intellectual attributes from man, and he is only an animal. Take away both classes of attributes, and the creature ceases to exist.

Therefore without going on, with an article already too long for one number of THE MICROCOSM, to analyze the separate actions, and meaning of each of these attributes of mind, which we know to be important to complete the "evidences," we will rest the case for the present.

NOTE:—this article is not written as a criticism of the work mentioned. The subjects treated

on in the work, as before mentioned, are those of "Insanity in its Medico-Legal Relations," which are ably discussed; and the suggestions should at once be acted upon, both by the several States and General Government in their Legislative capacity.

SPRINGFIELD, OREGON.

DRIVEN TO THE WALL.

The following note from Prof. Rogers of this city, with inclosed correspondence between himself and Prof. Mayer, will speak a volume to scientific students of the nearly two thousand institutions of learning where *THE MICROCOSM* is read. We have never known in all our experience a case of more self-evident scientific trepidation and want of true courage, than that exhibited by the great American physicist of Stevens Institute. It is a burning disgrace to the cause of modern scientific research that the representative physicist of America can thus skulk and not dare to speak a word on his own favorite theme upon which he has written textbooks, when courteously inquired of by a fellow teacher. But here is the correspondence, and let every student of science ponder the lesson it teaches. It can, of course, have but one meaning which is self-manifest on its face, and that is that Prof. Mayer knows in his inner consciousness that the wave-theory has utterly broken down, and that he dare not undertake to defend it. We thank Prof. Rogers for smoking him out even in one brief letter which, on its face, contains enough to expose the true inwardness of the whole trouble:

NEW YORK, Feb 15, 1884.

A. WILFORD HALL, Ph. D.,—Editor of *THE MICROCOSM*. *Dear Sir*—I take the liberty of inclosing you the following correspondence between Prof. Alfred M. Mayer of Hoboken, N. J. and myself, which will explain itself, and which you can print in *THE MICROCOSM*, if you think it would interest your readers. Very truly yours,

R. ROGERS.

NEW YORK, Jan 17, 1884.

PROF. ALFRED M. MAYER. *Dear Sir*,—I see in the Dec. number of "*WILFORD'S MICROCOSM*" (a copy of which I send you to-day marked) a demonstration against the "Wave-theory of Sound," by Capt. R. Kelso Carter, in which he shows that the tuning-fork has a slow motion, while the "wave-theory" says it has just the opposite. Please let me know whether or not the demonstration is correct, and if it is a real difficulty in the way of said theory, as I am puzzled over the matter. I enclose stamp for reply. Yours Respectfully,

R. ROGERS.

STEVENS INSTITUTE OF TECHNOLOGY,
HOBOKEN, NEW JERSEY, Jan 21, 1884.

Dear Sir,—All the men of science I know of hold that the undulatory nature of sound is the correct one. You will find their reasons for their opinion set forth fully in such works as Helmholtz on Sound. Tyndall "Sound," D. Appleton & Co. N. Y. Taylor "Sound and Music," D. Appleton & Co., and my little book, "Sound," also published by D. Appleton & Co.

It is useless to discuss the question further, as the above works contain *that* side of the question. If one reads the above and then reads the arguments against such views, he can form his own opinion on the subject. Yours truly,

ALFRED M. MAYER.

NEW YORK, Jan. 22, 1884.

PROF. ALFRED M. MAYER, *Dear Sir*,—I am in receipt of your letter of yesterday in reply to mine of the 17 inst. I am quite disappointed that you did not answer my inquiry or even refer to it, a matter of the greatest importance to me, and the only thing that induced me to write you. I knew you to be the highest authority on acoustics in this country, and that you had tuning-forks at hand, and all the requisites to repeat Capt. Carter's experiment. It would take you but a few minutes to run over his calculations, and either verify them or expose their fallacy. If Captain Carter has really stated in his Report what is not true about the exceeding slow motion of the prong while still sounding audibly, I should take pleasure in joining with you to expose him and the editor of *THE MICROCOSM* to the world. But if his statements are correct, that the fork sounds distinctly while its prongs are moving only at the velocity of one inch in two years, or even but one inch in an hour, then it must seem that the present theory of sound is wrong, since all authorities teach that the prong must advance *swiftly* in order to compress the air and send off air-waves or condensed air-pulses at the velocity of sound.

I am perfectly familiar with the works you refer me to. But of course, these are the very authorities which Dr. Hall, editor of *THE MICROCOSM*, and Capt. Carter have impeached as erroneous. Those works tell us that the prong must pass *swiftly* through the air in order to produce sound, whereas the Report I sent you makes its travel the slowest motion on record even while yet sounding audibly. I beg of you not to ignore my inquiry and leave me and others in the dark, when you could so easily let us know if that Report of Capt. Carter's is correct or a mere fabrication. As a teacher of acoustics, and an author in that department of science, we must look to you for light, now that the theory of sound, as taught by you and all physicists, is denounced by a professor of higher mathematics as erroneous, and with very plausible reasons for the denunciation. By simply answering my former inquiry in regard to the correctness of Capt. Carter's report, as printed in the December *MICROCOSM*, and if wrong how far it is wrong, you will greatly oblige many besides. Yours truly,
R. ROGERS.

[P. S.—I should be glad especially to have you tell me if the wave-theory of sound would be endangered provided Capt. Carter's figures should prove correct, or even one millionth part correct. And if it should be endangered thereby, or have to be abandoned on that account, whether or not the substantial theory of Wilford Hall is the only alternative.—R. R.]

NEW YORK, Feb. 5, 1884.

PROF. A. M. MAYER, HOBOKEN, N. J.,—*Dear Sir*,—Some two weeks ago I wrote you in reply to your note in answer to my first communication, almost begging of you for information on the sound-theory upon which you are an author and an acknowledged high authority. The information I asked could have been furnished by you in a few minutes, with your experience in acoustical investigations and your perfect familiarity with the whole question. I am surprised, after your first kind letter, showing a disposition to aid me and others who are waiting for your reply, that you have failed to respond to my last courteous letter, thus still leaving me and others in the dark on a matter upon which the very life of the current doctrine of acoustics, as I conceive depends. I do not see how you can reconcile this silence with your position as the acknowledged

leader, and the most prominent exponent of the wave-theory of sound in America, especially when a friendly investigator, met with a serious difficulty, appeals to you kindly for aid, and which, one way or the other, you could instantly have given. Your referring me to published treatises on the subject—works now impeached in a public journal and by a leading mathematician as fallacious on the very subject about which I inquired—was not what I expected, as it was presuming that I was not aware of their existence, though I now forgive it. That you did not then answer or even refer to my inquiry, and that you still persist in not answering my questions or giving me any information on this serious impediment to your public teaching on Sound, drives me, as well as other interested parties, to conclude that you are really afraid to commit yourself one way or the other on this matter. You surely are aware that there is a formidable opposition being organized against the theory of which you are the chief exponent in this country. Teachers in this city and elsewhere are waiting anxiously to see whether or not their acknowledged general is about to show the white feather, and not even make an effort to defend the camp against the bold marauders who are now defiantly challenging you to the combat. I send you this final request for the information previously asked, and trust that you will comprehend the situation as well as the unenviable position in which you are placing yourself by still declining to respond.

Your sincere Friend,

R. ROGERS.

SPECIMEN PRESS-NOTICES.

We could fill whole numbers of this Magazine with the favorable and even enthusiastic notices it receives from our exchanges, but we print the following only as a fair specimen of the others:

[From the Louisville (Ky.) Courier-Journal.]

WILFORD'S MICROCOSM.—This little religio-scientific monthly is one of the best of the many modern evidences of the truth that the God of the Bible and the God of Nature are the same, and that the religionist and the scientist have no cause for quarrel. The original papers are all of a high order, and preachers who desire to keep abreast of the thought of the age will find much help here. If it be true, as sometimes said, "that the pews are ahead of the pulpit, in both reading and in thought," then the lay support of this magazine should be large.

[From the Columbus (Ohio) Herald.]

We take pleasure in saying to our readers once more, what we have already so often said, that THE MICROCOSM, the only Magazine of its class, is in all respects a remarkable depository of American thought and original research and one of the most intensely interesting publications of the day. Whether its new doctrine of Substantialism is indeed the long desired ark in which Christianity is to find lasting refuge from the assaults of modern materialistic infidelity, we are not yet prepared to say; but we have no hesitation in declaring that the new teaching is eminently worthy of profound consideration, by both the scientific and religious world. At all events it is a bold, strong, able, consistent and seemingly irresistible assault upon the very citadels of the materialistic philosophy. Science cannot afford to ignore it; nor can religion afford to neglect it."

[From the Anna (Ill.) Farmer.]

WILFORD'S MICROCOSM for February contains a score of scientific papers on the discoveries, theories and investigations of modern science and religious thought. This monthly Journal at only

\$1 a year has more brains crammed into it than any other similar publication of its size and price in the world. Reading men should send 10 cents for a sample copy to Hall & Co., Publishers.

[From the Christian Quarterly Review, Jan. No.]

"The December number of THE MICROCOSM is on our table, as well as the preceding numbers and the *Problem of Human Life*. THE MICROCOSM is a religio-scientific Magazine, a publication *sui generis*. The novelty, boldness, and originality of the Editor and the subjects treated, have drawn around him a host of original writers, and have secured for it a subscription list *unprecedented*. Dr. Hall has prepared an article for the April number of the *Quarterly on Substantialism* which will be very readable and instructive. It is a subject now vital to Christian faith and demanding careful study. This article will cause the reader to *think*, and give him points to investigate," &c.

COLLEGES BEGIN TO RESPOND.

Numerous Presidents and Principals of colleges, to whom we have been sending THE MICROCOSM for the benefit of the students are beginning to show their appreciation of the new departure. We could print many letters indorsing the revolutionary work of this magazine. Here is one as a sample from the Rev. L. M. Stone, President of Shuqualak College, at Shuqualak, Miss. :

MESSRS. HALL & Co. *Sirs*—You have sent me four Nos. of WILFORD'S MICROCOSM, which I have carefully and studiously read. And to say that I am delighted would not express the half of what I enjoy from its reading.

Two papers in December No.—Physical Law, and Transmission of Pulses—are worth ten times the cost of a year's subscription. This work sent out every month to thousands of honest readers, bold and earnest as it is in its efforts to reach truth in spite of any theory, however hoary with age or however popular because of the great name of its author will awaken new life all over the country in the facts of science, philosophy and religion.

Send me your *Problem of Human Life* and I will remit price by postal note. Continue to send MICROCOSM for the benefit of my school and we will all thank you.

Truly yours,

L. M. STONE.

LECTURES ON SUBSTANTIALISM.

New recruits are constantly taking to the lecture platform in favor of "Substantialism," several of them being students of the different colleges. Ministers are even taking vacations from their regular pulpit labors and going on lecture tours, believing that the Substantial Philosophy properly presented, will do more good than ordinary sermonizing, as it will be certain to secure a hearing from a class of thinkers that the usual pulpit services will not attract. Here is a case as a sample, of a new recruit from the Pacific Coast, whose letter speaks for itself:—

A. WILFORD HALL, Ph. D.:—Your *Problem of Human Life* is bearing fruit on the shores of the Pacific. I have just delivered my first lecture on "Substantialism," and made it *hum* from the prongs of a tuning-fork, and *flash* from the poles of a magnet. *There is no estimating the Power for good that you have put into our hands.*

Yours for the truth,

ISAAC A. FLINT,

Pastor of the First Christian Church,
YAKIMA CITY, W. T.

WILFORD'S MICROCOSM.

23 Park Row, New York, April, 1884.

A. WILFORD HALL, Ph.D., Editor and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

THE SUBSTANTIAL PHILOSOPHY.—No. 1.

[From the *Christian Quarterly Review*.]

BY A. WILFORD HALL.

What is "Substantialism," of which the public is now hearing so much? In a broad and general sense it is claimed to be a New Philosophy of entitative being, animate as well as inanimate.

To claim however, anything new in philosophy at this late day, we admit to have an arrogant look on its face, especially in the light of the numberless so-called systems of philosophy, that have come and gone during the last three thousand years of the world's history. Before, however, condemning this claim for a new Substantial Philosophy as presumptuous, not to say preposterous, we beg to be heard in its explanation and defense.

Until quite recently the term *Substantialism* was unknown, or at least was not in use. It is not now, we believe, to be found in any Dictionary, though that we apprehend will not be the case long. Five years ago as we learn, the word had never appeared in print, much less had it assumed a prominence commanding the respectful attention of scientific and religious thinkers throughout half a continent. At this very time the word, instead of being an obscure one, is upon thousands of enthusiastic tongues, is heard from hundreds of pulpits and lecture platforms, and is appearing in scientific and theological treatises in scores of current publications. And what is better, the more it is examined into, discussed, and understood, the stronger and more courageous do its adherents become in its support. The Philosophy of Substantialism, therefore, thus shows every indication of having come to stay. But while it is praised and glorified by its friends as the central key to the arch in the structure that spans scientific and religious truth, it is also opposed and ridiculed by others who, it is claimed, do not yet comprehend its teachings, as but refined materialism with a strong tendency toward pantheism.

But *Substantialism* is totally unlike and distinct from both materialism and pantheism. Indeed it is almost exactly the opposite of both of them. It is *sui generis*, being unlike, in much of its basic principles, any philosophy heretofore taught either ancient or modern, resting chiefly upon claimed new discoveries in science and especially in physics, which could not have entered into any previous system of philosophy, unless this claim for new discovery be unfounded.

Materialism, as a philosophy, teaches unequivocally that *matter*, in its various forms and attenuations, is all the substance or entitative existence there is in the universe, while Substantialism teaches that matter constitutes but a small fraction of the real substantial entities in *Nature*.

The great leaders of materialism hold that mind, soul, life, and spirit, are not substantial in any sense whatever because not material, but that they consist of various modes of motion—mere motions of the brain and nerve molecules “placed together in a most varied manner,” as Prof. Haeckel expresses it in his *History of Creation*; and since motion is nothing entitative or substantial, being a merely phenomenon of matter, it necessarily ceases to exist as soon as the moving molecules of the brain and nerves come to rest. Hence, according to materialism, when the man dies and these material molecules cease to vibrate or move, the soul, life, mind, or spirit, which consists alone of such molecular motions, necessarily ceases to exist. Hence, materialism teaches necessarily that no immortality or future conscious existence is possible for humanity. Substantialism, on the contrary proclaims the exact opposite of all this, namely that everything in the universe of which the mind can form a positive concept, whether visible or invisible, whether tangible or intangible, whether corporeal or incorporeal, is substantial in some form or degree, and that the soul, being an incorporeal conscious substance, cannot be destroyed, and hence as a conscious entity it will live forever. It is therefore, in its fundamental or basic principle, the direct opposite of the materialistic philosophy as universally held. The same may also be averred of pantheism. While that philosophy teaches that the system of Nature itself—the material universe with its fixed, but intelligent laws and forces—is God, and all the God there is or ever was or ever can be, Substantialism teaches the direct opposite, namely, that God is a personal and Supreme intelligence, who rules over Nature, is in fact the Author of Nature, and as much above Nature with all it contains, as man is above the lifeless dirt; and that He not only created all things but that He clothes himself with Nature, including these elements from which matter came, as with a garment, and that He uses the universal laws and forces of Nature as the instruments of His will and power, with which to accomplish His ends. But let us not anticipate our subject too much.

We purpose during this brief exposition of the Substantial Philosophy to show what it is, as well as what it is not. We purpose show-

ing not only how it originated and what led to it, but what it aims to accomplish in the regeneration of physical science, and in the uplifting of the Christian church from the quagmire of doubt and uncertainty that have long environed her, placing her feet upon a solid rock of reason, philosophy and science, where she may safely and serenely defy the attacks of the enemies of religion.

The term *Substantialism* comes from the generic word *substance*, of course, which signifies, as its first or fundamental meaning, according to Webster,—“*that which underlies all outward manifestations.*” *Substance*, therefore, embraces in its broad signification every real existence, or entity, or thing in the universe that can in any manner produce a manifestation, whether that manifestation or its cause may come within the range of our sensuous observation or not. This definition does not alone apply, as we can readily see, to matter which includes only the gross or tangible forms of substantial being, or those forms which are ponderable, or otherwise physically manifest by chemical or mechanical tests, and from which word *materialism* has its derivation. It applies also to every force or invisible cause in Nature. Hence while all matter is substance or substantial, it by no means follows that all substance is matter or material. As a simple and familiar illustration of this distinction, it is a fact that all *iron* is *metal* but this by no means proves that all metal is iron. The broader term *metal* necessarily includes the narrower term *iron*, but the narrower by no means includes the broader. Many who have raised objections to Substantialism have failed entirely to grasp even this manifest and elementary distinction, and have thus declared their mental incapacity to conceive of any substance that is not material. We sincerely sympathize with those whose mental capacity is thus circumscribed, and whose minds are thus chained down to but a small part of universal Nature, and the much less important part at that.

It was the accidental acquaintance which we formed with a very candid and highly intelligent materialist—Daniel Smith—in Cincinnati, Ohio, some years ago, which first impressed upon our mind the importance of the distinction we have just made between matter and substance, and which constituted the turning point in our life-work. Mr. Smith firmly believed, and urged energetically, that the universe consisted only of *matter* and *motion*. He declared his total inability to conceive of any substance that was not *matter*, in some form or degree of attenuation, and that all outside of

matter which impressed our senses was but the motion of material bodies. Our efforts and various experiments, during several days sojourn with him, enjoying by his urgent solicitation the hospitality of his house, were chiefly directed to this single problem, in order to convince him that vastly more than one-half of the entitative universe was immaterial substance. Those earnest experiments were the entering wedge that has since fully unveiled to our own view the overwhelming proofs of the truth of Substantialism, of which we then had but the first inkling, and the basic facts of which we will soon endeavor to unfold.

While we were thus engaged with our friend at the very threshold of the New Philosophy, we were deeply impressed with what we have since been forced to regard as an incontrovertible scientific truth, and which all our subsequent investigations have tended to confirm, namely, that this grand but natural division of the universe, as already hinted, into material and immaterial substance, is the *key* to all true philosophy in science as well as in religion, and which will help to unlock more hidden recesses, solve more problems, and unravel more mysteries in both science and religion than any other single philosophical truth ever enunciated by man. It is not strange therefore, viewing this basic principle as we are forced to do, that we have made and are making the Substantial Philosophy so prominent a feature in our own Magazine, and to which we expect to devote the best energies of the remainder of our life.

This natural and necessary classification of the entities of the universe into material and immaterial substances being thus the central truth as well as the chief corner stone of Substantialism, it will be but a plain and, we trust, not uninteresting narrative to trace the progress of its development from this initial beginning onward, and thus watch its gradual growth to maturity.

As all Nature is thus divisible into the two great departments of material and immaterial substances, it is immediately manifest, that within each grand division, there must be also minor divisions or numerous gradations of substance, from the dense to the rare, from the grosser to the more refined. On the material side of this substantive line of demarkation, we have a most important and suggestive fact, one which ought of itself to impress every thoughtful mind, namely, that physical or corporeal bodies—those strictly denominated matter—are of innumerable grades of density and tenuity, grossness and refinement extending from the lowest to the highest

orders, from platinum the heaviest, and the diamond the hardest of all known bodies, up through the various metals, earths, minerals, woods, solid and pliable animal organisms, until we reach the domain of liquids.

There matter shows also, an ascending scale of similar various degrees of gravity, fluidity, and rarity, such as Mercury, Sulphuric Acid, Water, Alcohol, etc., till the boundary line of that division of substance is reached, and we enter by an almost imperceptible gradation upon the territory of gaseous fluidity, thence rising also in it through more and more tenuous degrees of rarefaction from dense carbonic acid gas through our common air to its highest attenuation, as when nearly exhausted in the receiver of an air-pump, thence through the physical elements constituting air and water, namely oxygen, nitrogen and hydrogen, the latter being the lightest and most tenuous of all the known gases, till at last we reach the absolute boundary line of materiality, so far as is known to man, in that most wonderful of all corporeal substances called *odor*. This remarkable material substance is so entirely intangible and unrecognizable by man, except alone by the single sense of smell, that by no mechanical or chemical test yet devised can we verify its existence; and although admittedly a material substance—actual corpuscular radiations from the odorous body—it is nevertheless so almost infinitely attenuated and sublimed that the emission of cubic miles of it from a single grain of musk, for example, will produce no appreciable reduction in its weight. We can even, by the light Substantialism has furnished, see the wisdom of God in the creation of such a substance, thus marking out the very border-land of immateriality, in order to lead man's benighted intellect from a world of gross matter up to a sublimer realm of immaterial entities, and thus enable the atheist to feel after God by the fingers of his senses, and so discern Him as the fountain of all substance, though, in the language of the Apostle, He be not far from every one of us.

So nearly does this marvelous substance approach to the border-land of the incorporeal realm, and so nearly does it constitute the transitional span across the hiatus that separates the here from the hereafter, that certain scientists of the materialistic school, fearing its effects as an argument in favor of a substantial soul or spirit in man, have tried to theorize odor into another undulatory theory or so-called "mode of motion," a kind of "molecular vibration" of the atmosphere and the nasal organs, thus producing the sensations

of smell. But the danger, in such a daring venture, of exposing the radical weakness of other received "modes of motion," such as those of sound, heat, light, magnetism, electricity, life, soul, spirit, etc., has, we believe, caused this undulatory attempt to be abandoned as a philosophical failure, thus leaving odor where Professors Tyndall, Helmholtz, Carpenter, and other great scientists have placed it, among the most tenuous of material substances. The very fact that these would-be originators of odorous air-waves (to act on the nasal membrane in the same manner as sonorous air-waves are supposed to act on the drum of the ear) have ingloriously abandoned the undertaking, ought, with the aid of a very little logical acumen, to cast serious doubt upon all the other theoretical "modes of motion" in any mind capable of reasoning philosophically. Plainly such a reasoner ought to see if one sensation (smell) is produced by the actual contact of material corpuscles so tenuous and so nearly immaterial as to defy all mechanical and chemical attempts at verification, that the other sensations above it (hearing and sight) may have merely stepped across the boundary line of materiality into the incorporeal realm of substantial entities, and may thus receive their sensuous impressions by a corresponding contact of the substantial but immaterial corpuscles of sound and light, generated and radiated according to the respective natural laws which govern them. If there be such thing in Nature at all, as immaterial substance, then how much more reasonable and consistent is this uniform substantial view of the various sensuous impressions as caused by one harmonious chain of analogous substantial corpuscular contacts, from the lower to the higher, from the material to the immaterial, than to suppose, as all science has heretofore taught, that Nature made an incongruous leap from substantial corpuscles in smell to mere motion in the sensations of hearing and sight? If the first three or lower sensations—touch, taste, and smell—are really produced by substantial contact with these organs, as none can dispute, is it likely that the wise Author of Nature would change His plan to a mere motion of the sense-organs in the higher senses of hearing and sight? We cannot conceive of a more irrational supposition; nor can we conceive of a trained scientific mind so illogical as to accept such an abrupt and unnecessary departure, such a disjointed want of congruity and uniformity in Nature's plans, after we shall have fully demonstrated, as we expect to do, the existence of numerous immaterial sub-

stances in Nature, which even act forcibly and exhibit palpable manifestations upon ponderable physical bodies.

These immaterial substances are divisible into three classes, namely (1) those which have intelligence in various degrees, such as mind, spirit, intellect, instinct, etc.; (2) mere life or vital force that does not think, belonging to both animal and vegetable organisms; and (3) the physical forces, neither vital nor mental, but wholly inanimate, yet incorporeal in their Nature, such as electricity, magnetism, gravity, heat, light, sound, &c., that permeate and pass through the solidest material substances in defiance of the material conditions of impenetrability, displacement, etc., by laws which the Author of Nature has ordained to govern such incorporeal substances. Let us then consider this phase of the question now distinctly presented, and see if it be possible to demonstrate beyond doubt the existence of this first or primal division of Nature's great realm—the existence of a vast domain of immaterial substances, of various degrees of grossness and refinement, corresponding with the chain of substantial entities as we have intimated in the material domain.

Having thus reached this field of research, what do we discover? Is it possible in reason that in stepping over this boundary line of material existences, we have left all real substances behind us when we have parted company with odor? It surely does not seem so to us, or that such a view can be rational to a philosophical investigator. Substantialism teaches, on the contrary, that we have only entered the hitherto unexplored and even almost unrecognized domain of the absolute physical, vital, mental, and spiritual entities which, though immaterial, underlie, manipulate, and control all material bodies, and from which domain, as their source, all material worlds have their origin, and from whose delegated power all visible and sensible manifestations are now observed in sensuous phenomena. These real entities, from the most refined spiritual and mental substance in Nature downward through the lower mental powers and instincts and the coarser vital substances of the animal and vegetable kingdoms, still downward through the physical but substantial forces of gravitation, electricity, light, heat, sound, magnetism, etc., are all around us in space as real entitative existences, in ten thousand forms and operations, as Substantialism tells us, had we but the higher mental vision to behold them. And what is peculiar of incorporeal substances, unlike material bodies, they do not interfere with each other

in space, but a thousand of such entitative existences can occupy exactly the same corporeal place at the same time. If the physical forces be really immaterial substances, as Substantialism insists, it is plain that gravity not only occupies the minutest molecules of material bodies, but that light, heat, sound, magnetism, and electricity can all occupy the same material atoms at the same instant of time without displacing or in any way interfering with gravity, or one with another.

(To be Continued.)

DR. ROBERTS ON COLD AS AN ENTITY.

REVIEWED BY THE EDITOR.

The paper of Dr. Roberts, in reply to our solution of the cold problem in the February number of *The Microcosm*, will be found elsewhere, and should be examined carefully before reading this rejoinder. We must confess our disappointment and regret at receiving that paper still insisting more energetically than before that his position on cold as a substantial entity or force is correct. We regret, especially, this positive manner of the Doctor's reply, with the plain facts of the case, as we expect to show in this answer directly against him, since he is thereby locking the door behind him and throwing the key out at the window, thus making his future escape quite difficult, if not impossible. We have written him privately, urging him to reconsider his reply and let the matter drop before still further committing himself irrevocably to a prodigious scientific fallacy, assuring him if we were forced to print his reply, that our answer to it would not leave him an inch of ground to stand on. Herejects our advice, apparently mistaking it for an evidence of weakness or inability to answer him, and with increased positiveness of tone he reasserts the unmistakable correctness of his position. So there seems to be nothing left, but for us to print his paper in reply to our solution, and to answer him, which we now do.

We gave notice last month that his present paper, and our answer to it would close the controversy on cold as an entity. He protests against such a course, intimating that it looks as if we intended to shoot and then "hide" or "run." Rather than allow him to entertain such a view of our management of this Magazine, we shall stand magnanimously and let him return our fire once more, if he has a spare cartridge left after reading this answer. But an interminable controversy on the subject is out of the question. Now to the task before us.

To say that the Doctor presents his case forcibly and defends his positions ingeniously, or in such manner as to carry with him any but those who think closely on such critical scientific matters, is to admit only what appears, manifest on the face of his argument. But all this, plausible as it appears, requires only a little cool logic and critical analysis, and it can be swept away, as we now undertake to show, so that not a vestige of it will remain.

First, as to a little matter of correction.

The Doctor, in his haste, entirely misapprehends our position about the "normality" of the universe. Speaking of our view, he says: "His position, that all liquids were ice in the beginning, as their *normal condition*, is not tenable," etc. We simply never said, nor thought anything of the kind. We plainly said, and repeat it here, that the *normal* (not *original*) condition of all present liquids is ice or a state of *solidity*, and this is true, whether water originally, or "in the beginning," was created as fluent *liquid* or in the solid form of *ice*. We presume the Creator might have combined the constituent elements of oxygen and hydrogen in the absence of heat, and thus have made only *ice* "in the beginning," but as heat, or the force-element from which it comes, was one of the original elemental substances, with electricity, gravity, etc., as "Substantialism" assumes, co-eternal with the Deity himself, it is more probably and rational to suppose that He originally formed the water in the midst of heat, and consequently in the form of *liquid* or possible *vapor*, which it must be inevitably, except by the removal of heat partially or wholly, which makes it ice. If not a particle of ice had ever existed in the universe, on account of the eternal and all-pervading presence of *heat*, it does not disturb the great fact, that ice is the normal condition of water, as we define *normal*, that is to say, just what it would have been had the abnormal, or phenomenal condition of *heat* been withdrawn. This is as true and simple a proposition as that *darkness* is the normal condition of the universe, and that, too, if *light* had always existed in every place from eternity, and if no darkness had ever been permitted. Darkness, the Doctor now frankly admits, is *nothing at all*,—simply a name we give by common consent to the *absence of light*. But God is said in Scripture to "create darkness." This he can only do, as Doctor Roberts would admit, by a withdrawal of light just as we create darkness, or just as He would create cold, simply by a withdrawal of heat, or just as He would create *silence* by stopping off all *sound*. Now as both darkness and silence are *nothing*—mere negations, or the absence of substantial entities or forces—why insist so uncompromisingly upon cold being anything more than the absence of heat, when that will fully explain every problem involved, as will be shown ere this reply closes. The Doctor would agree with us at once, that *silence* was the normal condition of the universe, and that sound was the *abnormal*, or phenomenal condition, even if silence had never occurred; and that *darkness* was the *normal* condition, while light was the abnormal or phenomenal condition, whether or not light were ever absent so as to cause darkness. Yet if light or heat existed with God from eternity, as a part of His substantial being, it can still only be regarded as an eternal or uncreated abnormality. Such a slight extension of the meaning of the terms *normal* and *abnormal*, we regard as a philosophical necessity in order to round out their true intent of signification. By the *normal condition* of anything, therefore, as we are forced to define it to convey an intelligible idea, we do not mean the *original* condition, but we mean that condition which it would inevitably be in, but for the presence of phe-

phenomena, or active energy. By keeping this definition in mind, no confusion can occur. The Doctor asks what we mean by God as a self-existent abnormality? We simply mean a self-existent embodiment of intelligence, energy, and phenomena, and without which there would be no God. Hence we never thought of assuming that cold, or darkness, or silence, or ice, was the original condition of things "in the beginning," but only that condition which would have been normally, but for the phenomenal or abnormal presence of active energy.

So much by way of prelude before coming to the critical part of our discussion; and right here we accept the Doctor's defiant challenge in his last paragraph but one, and will show so conclusively on which side the "self-stultification or inextricable entanglement" belongs, that he will be sorry he did not take our unselfish advice and suppress his reply. First he admits that we properly teach, "that the active power of heat is radiation;" but he asks, "What is radiation? and what induces it?" and then says that we will do well to try our hand "at an explanation of this phenomenon on the hypothesis that cold is nothing." There is not the least difficulty in explaining it on that hypothesis, though we would be at a total loss to even guess an explanation if the Doctor's position were correct, and that heat and cold are two equal but opposing forces, neither yielding till it is fought out and expelled, or destroyed by the other! Of course heat radiates, chiefly to produce an equilibrium of temperature, by a law of Nature ordained for that purpose, just as light, sound, or electricity travels each by a different law of its own. The Doctor might just as well ask what makes light radiate from a luminous body, at its tremendous velocity, unless darkness is an active force that opposes it and thus compels it to flee, or else kindly takes it by the hand and leads it out? Why, the Doctor would laugh at such an idea if seriously presented, and would say to his uninformed questioner that light radiates by an active law of its own, ordained by the Creator, without the least reference to, or aid from, darkness, which is nothing but a negative condition; and he would thus state simple, incontrovertible, scientific truth. Then how funny to add, as he does, that "Radiation [of heat] is simply the joint efforts of cold and heat to establish equilibrium of temperature"! This does not, after all, look as if they were two antagonistic or opposing forces, contesting the ground inch by inch for mastery, but more like two mutual co-partners engaged in doing a good work of equalizing temperature by their mutual and "joint efforts"! But why don't the Doctor consistently carry out his "radiation" philosophy to light as well as heat, and say—"Radiation [of light] is simply the joint efforts of light and darkness to establish equilibrium of visibility"? There is just as much science and true philosophy in one as in the other. But here the Doctor's logic has even a worse lame joint. Why does he not tell us that the "Radiation [of cold] is simply the joint efforts of heat and cold to establish equilibrium of temperature." Not a word does he ever say about the radiation of cold, but vir-

tually admits that it does not radiate at all whereas it ought to radiate the same as heat if it is an equal and opposing substantial force! Now comes the first "self-stultification." Mark his language well. He insists (bottom of first column, page 267) that heat cannot radiate of itself or unless cold as a real entity turns in and helps it, and that it is by their "joint efforts" that the radiation and equilibrium are effected, and asks triumphantly, "Do you see the point, Doctor?" Then note, that he ridicules the idea of the "self-radiation" or "self-motion" of heat without assistance, or unless cold as an entity helps, and he adds, as if to clinch the nail, that "No power, energy, or force but intelligent life is self-acting." He thus either makes cold "intelligent life" to thus help lifeless heat to radiate by their "joint efforts," or he puts two lifeless things together to do by their "joint efforts" what only "intelligent life" can do! "Do you see the point, Doctor?" How plain it would all have been to the Doctor's confused ideas had he kept in view the fact that heat radiates by a law of diffusion ordained by the "intelligent life" of the universe—God—not by its "self-motion," nor by "joint efforts" with any other lifeless entity or nonentity, just as light radiates without any aid from darkness by a law of God in Nature. But all this will be made terribly clear to the Doctor after a little.

Plainly he states the truth when he says, that if all things were of equal temperature heat would not radiate. Why? Simply because heat would then be everywhere equally, of course, not because cold is an entity, by any means. Heat only radiates from a heated body into a body containing less heat, which we call colder for convenience of language. Here is the conclusive proof. If all things were equally charged with electricity, an entity perfectly analogous to heat, the electric force would not radiate or travel at all. Why? Can the Doctor tell? We assert positively he cannot except by giving up his theory. But here is the crushing answer. Electricity radiates, not by "self-motion" but by a law ordained in Nature, solely to bring about an electrical equilibrium, not because electric or magnetic cold, as we have a perfect right to call it, or the mere absence of electricity, is a positive force which compels electricity to travel! Surely the Doctor will not assume that magnetic cold, or the mere non-presence of electricity, is a substance, or anything more than a simple negation. Yet this magnetic cold or partial electric absence permits electricity to radiate by a law of Nature in all directions throughout a suitable medium for the purpose alone of establishing an electric equilibrium, in the same manner precisely as thermal cold, or the partial absence of heat, permits heat to radiate for the purpose of establishing thermal equilibrium, one kind of cold being no more an entity than the other! "Do you see the point, Doctor?" Thus, thermal cold "causes" heat to radiate just as magnetic cold causes electricity to radiate, both kinds of cold (being but the partial absence of the positive force) thus permitting a distribution or diffusion or radiation of such force to produce an equilibrium. If two water-tanks, one full and the other empty, were connected at the

bottom by an open faucet, it is plain that the *emptiness* of the one tank (corresponding exactly to *thermal* or *magnetic cold*) does not force the water out of the other tank; but it merely permits the water to run out by a law of Nature in order to establish an aqueous equilibrium. How plainly this appeals to our common sense! But the Doctor, according to his substantial cold-theory, would have to insist that this *emptiness* in the one tank is a substantial entity or positive force which unites with the water in the other tank, and that by their "*joint efforts*" they establish a water level! This is precisely like *electricity* and *magnetic cold*—its mere *absence*—uniting to establish electric equilibrium, as the Doctor would have to declare, by their "*joint efforts*." Was ever an explanation of a scientific problem plainer than this? Take the case of a Leyden jar charged with electricity. If we touch it with our finger we receive a shock (call it *heat*), simply by the excess of electricity in the jar radiating into our body to establish electric equilibrium, our body being less electrical than the jar. But charge us with electricity, as we have often been, till every hair would stand on end, and let us then touch the jar or any suitable object not charged, or one that is magnetically "*cold*," and we would charge that body, and would at the same time receive another *shock* (call this *cold*) in parting with our excess of electricity almost precisely as severe as previously received from the surcharged jar! This illustrates how thermal cold and heat may produce quite similar effects on the human system while cold is nothing but absence of heat, just as our magnetic cold is nothing but absence of electricity. We touch a hot iron and it burns us, producing pain. Why? Because its excess of heat radiates suddenly into our finger in order to establish equilibrium of temperature; we touch a piece of ice intensely frozen, and the heat as suddenly radiates from our finger into the ice causing pain almost similar to that of excessive heat radiating into us. This radiation of heat from us into the ice to cause equilibrium depends for its violence or intensity upon the difference in heat between our finger and the ice, this difference being so great, sometimes, especially in the arctic regions, and the radiation of heat so sudden from our finger on that account, as to cause disintegration, resembling a blister by excessive heat radiating into our finger from a red hot iron. It is only the action of heat, radiating in both cases to produce equilibrium, just as the shock occurs in both cases whether the electricity radiates into us from the jar, or *vice versa*. All our ideas of *warm* and *cold* are simply from the radiant action of heat. If the temperature of the air exactly equals ours, we feel no sensation either warm or cold. If our temperature is lower than the air, then the heat from the air radiates into us, making us feel warm. But if the temperature of the air is lower than ours, we commence radiating our heat into the air, and this produces in us the sensation we call *cold*, both effects, however, being caused by the radiation of the excess of heat either into us or out of us. The electric shock, just referred to, acting both ways, is a complete illustration of this law *while one*

force only is involved in the entire operation; and it seems strange that there should be any confusion in the matter.

We do not wish to press the Doctor further on this annihilating proof of the fallacy of his theory, and would gladly help him out of the involvement of his unfortunate misadventure. But he rejects our overtures and will have nothing but downright argument. We can, therefore, only show him the way to get out of the difficulty himself. Whenever he can tell what makes electricity radiate to establish electric equilibrium, without calling it "*self-radiation*" or "*self-motion*," or supposing it to be by the "*joint efforts*" of itself and its own absence (magnetic cold), he will not have the slightest difficulty in solving every problem he has raised, or can raise, on the supposition that thermal cold is an entity. By such investigation he will soon discover that upon this single rock his whole theory splits into a thousand pieces. But if that line of reasoning will not convince him we propose to leave him entirely without excuse by a single argument at the close of this answer.

And here let us say, in passing, that this natural law, or tendency to diffusion which causes heat to radiate from one body of greater heat, into another possessing less heat, thus seeking to establish equilibrium, would seem necessarily to preclude the possibility of the absolute non-presence of heat, even in the coldest ice of the arctic regions, though in our former article we conceded to Dr. Roberts that ice thoroughly frozen is devoid of heat. We made that admission inadvertently, as we had not studied that point carefully enough, but we cannot go that far now, after more mature reflection. Ice can be frozen solid at 30° F. But it becomes colder and colder by thermometric test down to zero, then on down to 40 degrees below zero, when the mercury solidifies in the bulb of the Fahrenheit thermometer. Of course it could only become colder by the radiation of more and more heat, or by absorbing more of the Doctor's *cold*; but as long as there is any room for more *cold* to get in, according to the Doctor's idea, there must have been some heat there to get out and thus make room! "Do you see the point, Doctor?" Then by another thermometer of greater range we still trace the further radiation of heat even from that arctic ice down to the equivalent of 60° or 70° F., and all the time it is solid ice, though all the time having some heat yet to part with, making the cold, as we call it, or *heat-absence*, more and more intense. Clearly, if there were not some heat left in ice even at 60° below zero, it is plain that a thermometer in contact with it could not continue to go down! We doubt if it is possible for man to construct a thermometer that would record the temperature if all heat were to radiate from ice, and we do not believe, from the universal law of heat-radiation, that it is possible on this earth for heat to be entirely absent from anything unless by miraculous intervention. We doubt, in fact, if a man could live a single minute and breathe our atmosphere if it were entirely free from heat.

Cold, therefore, in all our experience, as just intimated, is plainly but the partial absence of heat in various degrees of radiation,

cold and heat being merely comparative terms based on our sensations. We place our hand in water at 90°, and if the temperature of our blood is at 80°, the water is *warm* to us, simply because its excess of heat radiates into our body to form an equilibrium. But if our blood is at 100°, as it often is in a fever, then the water at 90° is *cold* or *cool*, simply because the excess of heat in us radiates into the water to equalize the temperature of the two. *Cold*, as an entity, has nothing whatever to do with it. In each case it was simply a matter of *less heat*, or *more heat*, cold being merely used for convenience of language, to express the idea of *less heat*. And we here assert, and challenge the Doctor to the test, that the phrase *less heat* or *heat-absence*, or some equivalent form of expression can be correctly substituted for *cold* or *cool* wherever such terms occur in our language and thus convey the true scientific idea of all temperature below the heat of our blood. Let the Doctor try it for a week and he will give up cold as an entity. The *colder* anything is the *less heat* it possesses, and that's all there is of it.

The Doctor says most truly, that "cold must exist before a single degree of heat can radiate." But does this prove cold to be an entity, or anything but partial absence of heat? By no means. *Magnetic cold* must exist before a single degree of electricity can be radiated, yet this magnetic cold, as before shown is simply the *non-presence* of electricity. It is strange that so plain a scientific truth cannot be grasped! All the Doctor's talk about the "self-motion," "self-radiation," and "self-destruction" of heat, and that nothing but "intelligent life" has "self-motion," etc., is totally silenced by the radiation of substantial electricity by a law of God, without "self-motion," or any aid from *magnetic cold* except to give it room, just as thermal cold aids heat to radiate by doing the same thing! Electricity is not "intelligent life," and most surely its absence is not.

Then, again, the Doctor is manifestly right, when he says that "no one with a scintilla of scientific knowledge will claim that *nothing* can do anything, much less produce the wonderful displays of power in the radiation of heat." Now all that is needed again to set the Doctor right is to say as before, that *cold* does not cause the radiation of heat at all, except as mere *vacancy* or mere *heat-absence*, to give it room, like the empty tank in the case of water, and thus permit it to radiate by a law of Nature; just as *magnetic cold*, a perfect nonentity, gives room to electricity and thus permits it to radiate.

We come now to the Doctor's comments on our demonstration. It is gratifying, to begin with, that he admits our facts, as given about the iron bar, both in heating it, and freezing it, to be correct; but he strangely sees or thinks he sees in those facts a different conclusion than the one we reached. Let us now critically consider his difficulties. He admits that the heat will travel into the cool end of the bar when the red-hot end is thrust into cold water, and asks, "What makes it travel thus?" Plainly, we answer, nothing but radiation. The heat radiates in all directions, or into anything of a lower temperature. When the heated bar is

held in the rare and partially warm atmosphere, it radiates very slowly; but thrust the hot end of the bar into cold water and the heat is intensely agitated by its more rapid radiation into this denser element of still lower temperature, and this agitation of the substantial heat causes it to take advantage of the cooler portion of the bar, and radiate also in that direction, till it will become quite hot, solely by the radiation of heat. The Doctor, still not grasping the point, concludes that "by some sort of *hocus pocus*," the substantial cold in the water "causes this movement of heat, which is a pretty good feat for *nothing* to perform." We answer, as we did before, that this *cold* or *less heat* in the water merely permits the heat to radiate in all directions, up the bar as well as into the *less heated* water, just as the *magnetic cold* of the *less electric* medium—this partial absence of electricity—permits the electric force to radiate, and thus produce electric equilibrium. Plainly, to suppose the *thermal cold*, or partial absence of heat in the water, to be a real entity, and that it drives the heat along the bar by its positive force, would be precisely the same as to suppose that the *magnetic cold* or *unelectric* condition, was a real substance, and that it drives the electricity along the wire by its positive force, when it is simply a negation, as already shown, and as Dr. Roberts would at once admit. Again, we insist that the Doctor shall follow out this beautiful illustration of the unmistakable action of electricity, and the scientific reasons for its so acting, and he will come out all right on this simple problem of cold and heat.

But the strangest part of the Doctor's argument is his attempted answer to the other half of the demonstration—when the frozen end of the bar is thrust into the furnace. The cold, he admits, will not radiate along the warm bar from the heat of the furnace, as did the heat from the cold of the water? Why should it not, pray, if one is a positive force as much as the other, and its exact opposite? Here are his own singular words of explanation:

"But, when the bar is cold, heat does not drive the cold out. Certainly not. *Cold was the original occupant and will not be driven out; for, to submit to this process would be to push itself out at the end away from the fire and thus make room for the usurper!*"

Not quite so much "joint efforts" between the two to work in mutual coöperation as a moment ago! Why should not these two "substantial entities" unite their "joint efforts" in this case to radiate the cold along the bar, just as in the previous case the heat was radiated along the bar, as the Doctor asserts, by "the joint efforts of heat and cold to establish an equilibrium?" Such an unaccommodating entity as heat seems to be, in not returning the compliment to its cool neighbor, and by "joint effort" helping it also to radiate, ought to be turned out into the cold! In all candor, the Doctor's attempt to get over the conclusive demonstration our experiment furnishes is more deserving of our sympathy than our sarcasm.

His question as to how the cold gets out of the bar, when the frozen end is thrust into the fire, since the heat does not drive it out along the bar, positively causes us to smile. He still goes on the assumption, of course, and takes

for granted, that *cold* is a real substance, and that it has to get out in some way; and as it is not driven out along the bar, it must, he thinks, submit to the embraces of heat and be caressed before departing, rather than take to its heels and fly, as heat did in the other case! He really gives it as his philosophical opinion that after the heat of the furnace has thus caressed the cold of the bar for a time, it concludes to "let it go!" Then all of a sudden it occurs to the Doctor's mind that this is lowering the dignity of *cold* a little too much, being an equal, to be thus dandled by heat as a superior and then unceremoniously dismissed; so he be-thinks himself thus: "*Or, perhaps it would be more in accordance with the facts (!) to say, that cold from without comes and demands its own, heat accedes to the demand, and equilibrium is restored!*" We must insist that this is too funny for THE MICROCOSM. Still we print it. He then asks us to tell him how that cold got out. Why bless you, Doctor, there was nothing to get out! There was only a partial absence of heat in that frozen end of the bar, and therefore, when the heat of the furnace took possession, it simply occupied a room already partially vacant and waiting for its occupancy. Why does not the Doctor ask how the *emptiness* got out of that water-tank while the water from the other tank was taking possession of it? Why does he not ask how the *magnetic cold* or *electric vacancy*, got out of the man who touched the surcharged jar while the electricity from that jar was taking possession of his body? Why does he not ask us to tell him how the *darkness* gets out of the room when we turn on the gas? We would answer him scientifically just as we have done in regard to cold. The room was already vacant and there was nothing at all to get out—the darkness, as he admits, being only the absence of light. Now let the Doctor tell us how the darkness gets out of the room on lighting the gas, according to his scientific view of cold. Why, he would tell us, or at least should, that the darkness of the room is taken up into the bosom of the light, and after being caressed for a time the light "*lets it go, or perhaps it would be more in accordance with the facts to say that the darkness from without comes and demands its own, light accedes to the demand, and equilibrium is restored!*" We positively assert that the whole position of the Doctor is as reasonable and philosophical when it is applied to darkness, or even to the absence of electricity, as when applied to cold; and we will let any candid man in the world who can think scientifically be the judge.

But our contributor involves himself in another confusion of ideas, which we will kindly help him out of. He can't see how the radiation of heat can both *melt* ice and *make* ice. He is no doubt honestly puzzled over this most superficial difficulty. He admits that the radiation of heat *melts* ice, but for the life of him he cannot see the other, which is just as simple, and he must therefore excuse us for a much longer paper than his own, when he will raise so many simple, and we must declare trifling problems which, though easy to solve, take many words to elucidate. Let us first show him the philosophical principle involved in the operation of producing ice by radiation of heat,

and then give him a demonstration that will cause him to open his eyes.

Hot water radiates its heat to melt ice. This he grasps. But can he not see that in thus radiating its heat to melt ice it necessarily parts with some of its heat and becomes cooler? The hot water cannot radiate its heat and keep it at the same time. Then by radiating still more of its heat to melt more ice it parts with still more of its heat and thus becomes still cooler and cooler, or retains less and less degrees of heat till it reaches 32°, *when it becomes ice, all by radiation of its own heat and nothing else!* Yet the Doctor forces us to consume space, and thus make such elementary explanations as this.

But now we come to the promised demonstration. The Doctor has, no doubt, heard of an ice-machine, or an apparatus for manufacturing ice artificially. If he has, he surely knows that the only way water can thus become colder and colder, till finally solidified or turned artificially into ice, is by adopting the same principle, precisely, that Nature employs, only by a different process, namely the *artificial radiation of the heat from the water into the surrounding air!* In our county, state, and national expositions the prize is always awarded to the ice-machine which will cause the most rapid radiation of the heat from the water, and at the least cost of steam power, *in order, of course, to turn the water into ice!* No scientific inventor of an ice-machine ever dreamt of claiming to manufacture ice in any other way than by some process of radiating the heat from the water and thus allowing it to return to our originally-described *normal condition* of solid water which we term *ice!* "*Do you see the point, Doctor?*" If an inventor should come before the exposition board with a machine in which he claimed to make ice on the plan of Dr. Roberts, by gathering "*cold from without*" and injecting it into the water, he would have his machine kicked out of the fair-grounds and himself handed over to the nearest lunatic asylum.

Thus we prove that *heat* produces what we call *cold*, and consequently *ice*, both *directly* and *indirectly*; *directly* through the steam power used in producing the radiation, and *indirectly* by its own withdrawal from the water in the act of radiating; thus letting the water solidify or "*return to its normal condition*" on account of its *less heat*. To see, now, how scientifically correct Dr. Roberts is on this subject, we quote:

"As like produces like, *heat can no more produce or cause cold, directly or indirectly, than a man can beget a monkey, or a monkey an elephant!*"

How terribly mistaken! Being on the wrong side of the question, he must, of necessity, be wrong in every argument he advances, however ingeniously he may frame it. But such arguments only require some one half as ingenious as himself on the right side, and their erroneousness is easily made apparent.

This, however, is not the end of his troubles. He is truly unfortunate in running into difficulties that produce confused scientific ideas. Here is another, which we take pleasure in removing. He can't see how water, an *inert* body, can "*return*" to its normal condition

(ice) by the simple departure of heat, if cold is not a substance which assists it, and then adds: "*To return is to act*, therefore the water freezes itself!" But as heat does not radiate of "*itself*" but by a law of diffusion appointed by the God of Nature, as before shown, therefore God, acting by a law of His own ordaining, causes every degree of the radiation of heat that occurs; and, therefore, God freezes the water by His own appointed act, and consequently the water does not "freeze itself!" But how can it *return* to its normal condition when "*to return is to act*"? Here is the simple explanation. The mechanical force which we put into a clock-spring in the act of winding it, and which we there store up, is the very power which unwinds that spring in the process of departing or radiating from it through the wheels of the clock, thus making it seem to a superficial observer to "unwind itself," and to run the clock at the same time. And to avoid this *self-unwinding* absurdity some profound scientists proceed to "awaken" another force called *elasticity* to help the spring to straighten out. But as elasticity is not a *force* but a *property*, merely, it is plain that the original mechanical force which wound the spring remains there stored up and unwinds it in the act of radiating. Then on the same principle, precisely, the mechanical force of heat, which alone keeps the water in a liquid state and prevents its solidifying, is the stored-up power or energy which, in the act of departing, allows the water to unwind its tension and, like the spring, return to its normal condition, making it thus seem to Dr. Roberts to "freeze itself," unless "cold from without," another force, comes to its aid and helps to solidify it.

But we must make it still plainer, so that nothing shall remain in the Doctor's way of grasping the true inwardness of this problem. He admits *silence* to be the mere negation of an entity, or the mere absence of sound. There is no man on earth, who would dare to claim *silence* as a substantial force—the opposite of sound. But the Doctor can sit in his parlor, raise the dampers of his piano, and sound the pitch of A with his voice, and this entity, *sound*, will start the A-string of the piano to vibrating and sounding audibly by sympathy with that note. Then let his voice cease, and he will find that the string still continues to sound on till it finally "*returns*" to its normal condition of *silence* by ceasing to vibrate. And yet this result, *silence*, is an absolute *non-entity*. The string thus *returns* to rest and silence, its normal condition, by being released from the tension produced in it by the positive entity *sound*, just as the water returns to its normal condition of cold and ice by being released from the tension caused by the positive entity, or force, *heat*.

The Rev. A. Brainard, of Charlemont, Mass., one of the score of thinkers who have indorsed our position, writes us:

"Is it not the universal tendency of Nature to *return abnormal to normal conditions*; and does not that fact help to demonstrate the scientific truthfulness of your position on cold?"

We answer yes; and it was one of the most unanswerable arguments against Darwinian evolution that abnormally bred pigeons, however

changed in form by the intelligent selection of the fancier, if let loose would, in a few years, return to their normal condition of form, color, habits, etc.

But there is no end to the Doctor's troubles. He thinks that it is not a fair case to compare *cold* to *darkness* and *silence* because in withdrawing light and sound their absence does not "*seem to act*." We have just shown that, in the case of sound, that when withdrawn the string not only "*seems to act*," but does act, in returning to silence and rest, just as much as the water acts in crystalizing or returning to cold and ice, making the two cases precisely parallel.

The Doctor asks: "Can a ton of silence be carried into a vast body of sound, and drown the latter?" etc. We answer, yes, substantially, just as much as a ton of "*cold*" can be supposed to produce any similar effect on heat. The "ton of silence" would be carried in the shape of a ton of *silent* strings tensioned to the pitch of the volume of tone into which they were carried. Then this ton of silent strings would commence sounding, and thus absorbing the sound that radiates from the Doctor's volume of tone, just as the heat, by radiation, takes possession of the ton of cold "in the shape of ice," and starts it to vibrating or melting! And as to the other case (*darkness*) we assert that it has just as much to its apparent credit as an entity as cold has. The Doctor asks:—

"Does the withdrawal of light cause *darkness to seem to act*? * * * * can a body of *darkness in the shape of ice or any other form, be transported from night into the blaze of noonday*? * * * * Who ever heard of *darkness or silence being carried about as an article of commerce or employed in the arts*?"

In the first place all these questions convey a false scientific impression, unintentional, of course, on the part of the Doctor. Ice is not *solid cold*, or cold "in the shape of ice" at all. Ice is simply *water* deprived of enough of its *heat* to make it *solid*, just as *lard* becomes solid by parting with much less heat than required in the case of water; or just as *lead* becomes solid by parting with still less heat than required in the case of *lard*. We have just as much right to talk about *heat* "in the shape of *liquid water*" as he has to talk of *cold* in the shape of *solid water or ice*, since water is liquid alone by the action of *heat* and solid alone by the radiation of a portion of heat, as heretofore demonstrated, which we call *cold* for convenience of expression. To talk about cold as he does, in the shape of solidified water (ice), is just as superficial and unscientific as to talk about cold in the shape of solidified *lead*, both being changed from the liquid state, as the Doctor no doubt will in time see, by the *radiation of heat in a greater or less degree*!

But we assert that all these things supposed to be done by cold, are done, and can be as truly done, by darkness, thus showing *darkness* to be a substantial *force*, the opposite of light, on the same principle. We therefore proceed to waste more words to do what it does seem to us the Doctor might have done himself before raising the difficulty. *Cold* is transported, he thinks, in the shape of a block of ice. Now we can in like manner carry a closet full of *dark-*

ness from the dead of night out into the blaze of noonday, and that closet so dark that a man within it cannot see his hand before him. This darkness is thus held secure, and transported from place to place, just as the block of ice, which holds the so-called cold, is transported. Then the man in this closet, having a plate of glass chemically prepared, that has been previously exposed to light under suitable conditions, goes to work and by aid of this darkness develops upon that glass a permanent and beautiful work of art in the shape of a photograph-negative, that all the light of the sun, or heat, or electricity in the universe, could never have produced; and these artistic works of darkness become "merchantable commodities," that are carried about and dealt in as articles of commerce, etc., etc. But what person who has ever taken the first lesson in photography does not know, that all this apparent work of darkness is simply and solely the result of the absence of light, and nothing else? On the same principle we assert most emphatically, that every apparent act of cold that can be named, is just as easily solved on the ground of the *absence of heat*, and we feel sure if the Doctor will clear from his mind the last vestige of prejudice, and reconsider the whole subject, not to maintain and defend his position, but for the truth's sake alone, he will see it substantially as we have here presented it. We say frankly, as we said in the February Microcosm, that at first we were with the Doctor in his revolutionary attack upon the doctrine of the text-books on this question, and every body knows that we are not badly in love with the old-fashioned philosophies which teach such superficial theories as we are compelled to combat and expose in this Magazine. But we could not, after careful study during sleepless nights, join with our friend in his new departure, though we wanted all the *entities* we could fairly get in support of "Substantialism," and were as anxious in this direction as was Dr. Roberts; but our Substantial Philosophy could not afford to lug in *nonentities*, under a mistaken pretence of science, and thus mislead the friends of the cause, exposing them to ultimate defeat. Eld. Thomas Munnell, our critical contributor of Mt. Sterling, Ky., is one among many, who appreciates this aspect of our argument. He writes us in a private letter, which we take the liberty to quote from:

"Your solution of the cold and heat problem reminds us of the Doctor who cured his cases so quickly, that he left the impression there wasn't much the matter with them in the first place. One thing is conclusively proved—you are not gone mad on 'Substantialism,' to fabricate *entities* where none exist. You maintain your equipoise admirably."

Others who were with the Doctor are now as strongly on our side. One of the strongest defenders of his position, and who sent us the most ingenious solution on that side of the question that we received—the Rev. D. Oglesby—gives it up, and has become a complete convert to our arguments. The weight of his opinion may be judged by his very critical paper on the sun's heat in the February number. We give his note complete:—

"WELL DR. HALL:—I give it up; your explanation and solution of the cold and heat problem, are

sublime. I count it *the* most magnificent scientific article that I have ever read. You know I believed with Dr. Roberts; but were I in the Doctor's place, I would frankly "own up," "confess the corn," and "stand corrected" without a word. I expect soon to get up a club for THE MICROCOSM." etc., etc. Yours, RICHVIEW, Ill., Feb. 1 1884. "D. OGLESBY."

But we must bring this paper to a close, and we do so by presenting one direct argument against the Doctor's position, which, as we firmly believe, will abundantly suffice to overturn it without the aid of another fact. This argument takes the breath of life right out of cold as an entity, and shows so plainly that a child can understand it, that all apparent increase of cold, in whatever degree, is but the simple decrease of radiation, or departure of heat to the same degree and nothing else. Here is the argument: Water *solidifies* precisely on the same law and by the same natural process, that any other body in a liquid state solidifies, when changing its temperature, whether it be mercury, lard, melted lead or iron. No candid man with any knowledge of science, will dispute this. Then take melted *iron* as one example. Here is the fatal fact. *It still remains intensely red hot after changing from a liquid to a solid state, or to a state, the exact equivalent of ice in the case of water!* Where now, is the Doctor's "cold from without," that comes to "demand its own," and to turn this liquid iron into *red hot solid iron*, or into iron "*ice*?" How can a thing be *cold*, or have any cold in it and be *red hot* at the same time? Plainly, this changing of the iron from a liquid to a solid condition, is caused alone by the radiation or withdrawal of a portion of the heat of the melted iron, thus making the congealed mass *less hot*, which for convenience of expression we may call *cooler* than the melted iron. But surely there can be no "cold" as an entity in a solid red hot mass of iron! Yet this liquid iron becomes solid precisely as liquid water becomes solid, namely, *by the radiation of a portion of its heat and by nothing else?* By the radiation of still *more heat* (which for convenience of language we call becoming *colder*), liquid mercury becomes solid, precisely as by the radiation of heat alone, as just seen, melted iron solidifies, or returns to its normal condition, or to the condition of iron "*ice*," if you please, while still remaining *red hot!* The Doctor would not think of questioning this solid state of the iron as being its *normal condition*, and that it becomes liquid by the abnormal, or phenomenal action of heat alone. How strange, then that he cannot see that the *normal* state of *water* and even of *mercury* is the *solid condition*, and that they melt or become liquid alone by the abnormal action of heat in various degrees, just as *lard*, *lead*, or *iron* becomes liquid! Mercury, in its liquid state, is simply and purely *melted* or *fused metal*, and nothing else, the same precisely as liquid iron is melted metal, only mercury melts from a solid state, by a very little heat, while iron requires incandescent heat! "Do you see the point, Doctor?" We sincerely hope so. If this red hot iron argument does not burn the scales from our contributor's eyes on the supposition of cold as an entity, let him extend it to melted platinum, which "freezes" or returns to its *normal* con-

dition of a solid, while many degrees hotter than iron, even in a melted or incandescent state.

The "freezing" of melted platinum, or the returning of this liquid metal unto its normal state of a solid, even while *incandescent ice*, is precisely the same natural process which returns liquid or melted water to *aqueous ice*, or fused quicksilver into *mercurial ice*, namely, *the radiation of a portion of the heat in each case, and nothing else.*

Not to press the matter further, but to give a fair opportunity to shorten this controversy, we now propose to Dr. Roberts, if he will logically and scientifically answer this one argument, we will ask no more, but will surrender without a word. There is no use of running off into a thousand and one things, that have the appearance of being the work of cold, but which are simply caused, as we have abundantly shown, by the radiation of heat in various degrees. Let him come right down to this one argument, as just presented, and set it aside without a quibble or evasion, and we will cheerfully acknowledge him victor. But if he cannot do it (and our readers will know), then we expect him, as a Contributor to this Magazine, frankly to confess his theory of cold as an entity broken down.

AN IMPORTANT SUGGESTION BY REV. DR. BAILEY.

HOW TO SPREAD SUBSTANTIALISM.

The question as to the best means of spreading Substantialism, so as to make the New Philosophy reach and benefit the greatest number in the shortest time, is the important question now agitating the minds of many ministers and other friends of religion who are fully convinced of the value of this doctrine in unfolding scientific and religious truth, and crushing out the errors of materialism and other phases of infidel science. We have received many letters from our subscribers urging us to issue a condensed pamphlet containing the gist of the arguments in favor of this New Philosophy, to be printed in as cheap and readable a form as possible, but on good paper, and to be sown broadcast by those who are willing and able to purchase a dozen, twenty, or even a hundred copies to be used for missionary work among those not able or not willing to buy the *Problem* or take *THE MICROCOSM*. The Rev. Dr. W. W. Bailey, of the Northern Ohio Methodist Conference, at Granger, writes us so kindly and enthusiastically on the subject, that we feel we cannot so well express the matter to our readers in all its force as to quote the chief portion of the Doctor's letter:

"Dear Bro. Wilford: I want to say several things, and scarcely know how to begin. I am more and more delighted with *THE MICROCOSM* the longer I read it. I am beginning to look upon it as one of the marked providential interpositions in the affairs of men, with which the Almighty now and then comes to the rescue of truth, and through which He lifts himself up more clearly and gloriously into the sight of thoughtful men. In thus speaking of *THE MICROCOSM*, I of course refer back also to its glorious fountain—the

Problem of Human Life, which like a mighty luminary has burst upon the race, and I cannot use a narrower term to express my conception of the power and glory of that grand and revolutionary work. I am waiting with the best patience I can command for the great scientists to declare hostilities against your microcosmic army. The sand-ropes of error cannot much longer bear the strain which you are so steadily applying to it, and which is so steadily increasing by the cohorts of volunteers constantly wheeling into line, ready to do service under the banner of Substantialism. Surely the great champions of materialism, now so heroically silent, will be soon obliged to speak or cry out, and when the break does come, and they are routed, as they inevitably must be, Where? What? Indeed it is exhilarating to contemplate it. Well, God bless you with continued health and strength, and with clearness of mind and with the holy daring of heart that have hitherto fired you to the work you are so bravely doing, till the artillery of truth trained by your skilful hand shall reduce the ramparts of the very citadel of error.

But here is what I wanted to say: The masses of the people, not able to purchase expensive books, and without time or patience to read elaborate treatises, want something brought a little nearer to their plane, both of mind and means. In substance my suggestion would be the propriety of giving to the masses, in the cheapest possible pamphlet form, and in the most condensed limit for absolute clearness, the new and wonderful doctrine of *Substantialism*—something so inexpensive that your multitude of readers could afford to take it to the people, and if they could not be induced to buy it at cost, let it be loaned to them on condition that they read and return it to be loaned again, and again, and so on till worn out! Thousands and tens of thousands would thus have their thoughts turned in the right direction. What the multitude want is, first a relish for the *manna*, which your writings have so opportunely caused to fall at this critical period of the world and the church; and I cannot think of any method by which you can get so near to the great heart of mankind as the one here suggested. Let the pamphlet have a substantial cover to stand wear, and let it first consist of some such general statement of Substantialism as the one from your pen contributed to the April issue of the *Christian Quarterly Review*, and then let it be extended by adding the best short essays or extracts from papers that have appeared, and that are now appearing, in *THE MICROCOSM*, as you would know how to compile them. The people are hungry for the very mind-food which your writings furnish. Of this I am sure, and all they need is to have the first taste. How well I remember, nearly three years ago, when I received a specimen copy of the little eight-page *MICROCOSM*. It riveted my attention at once. Without sleeping I sent for that marvelous book noticed on its last page, and, oh, how I have thanked God a thousand times that it was ever my privilege to read the *Problem of Human Life*! Since then my book has been out on an endless missionary tour until it is literally worn out, and many are asking, "when will it be my turn to read the *Problem*?" Please pardon me for this long letter. Your mind needs an occasional moment's rest from the severer strain of your telling discussions.

Sincerely your Friend,

W. W. BAILEY,

of the Northern O. Conference, M. E. Church.

[Continued on third page of cover, with other items of interest.]

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SPENCER'S LAW OF EVOLUTION.

BY ISAAC HOFFER, ESQ.

If evolution includes all the activities in Nature and their results, and means that all the operations and works of Nature and of man show that there has been a progressive development; if it means the *unfolding of a grand plan* in its advancing order; if it includes all this, and implies no more, then there is no room left for dispute; for no person who has any knowledge of geology disputes the position that there have been progressive changes in the works of Nature; and no person can look back ten years without seeing the evidence of progressive changes in the works of man. If, however, evolution means that all the changes wrought by the operations of Nature and of man are transmigrations—the evolving of one thing out of another—then the line of dispute is fairly drawn. Spencer defines evolution to be “a change from an indefinite, incoherent homogeneity, to a definite, coherent heterogeneity through continuous differentiations and integrations.” This change, he states, takes place in accordance with the following law: “An incident force falling on an aggregate, containing like and unlike units, segregates the like units and separates the unlike.” There is nothing in this definition nor in this law to indicate the evolving of one thing out of another; nor to touch on any particular theory that could invite discussion. Mr. Spencer, however, explains what he means by evolution. He says “that evolution is in a great measure co-extensive with progress. The law of *organic* evolution is the law of all evolution. Development of the earth, of life, of society, of government, of manufacture, of commerce, language, literature, science and art is the advance from *simple* to *complex* through successive differentiations, holds uniformly. From the earliest traceable cosmical changes, down to the latest results of civilization, we shall find that the transformation of the homogeneous into the heterogeneous is that in which evolution consists.” This whole explanation is just like his definition, except the “twists” in the general line of discussion, where he states that “the law of *organic* evolution is the law of *all* evolution,” and that it is an advance from *simple* to *complex*. In this explanation he reaches down into particulars and grasps a number of groups, but only to take them out of the sphere of separate investigation into the realms of generalization, where they are all dumped together into one pile and labelled “*Transformations of the homogeneous into the heterogeneous, produced through the operation of changes.*”

His definition of evolution is so wide-reaching, and so unlimited in its generalization, that it *includes everything and embraces nothing*. It is like the firmament that covers everything, is in sight of everything, but touches nothing, affects nothing and serves no known purpose

except to *round off the view*. Stripped of its high-sounding terms, and symmetrical form, and reduced to common terms, this great definition makes evolution to be “a change from a confused mass into dissimilar things through a process of varying and shaping.” This shows how wonderfully a fine dress improves an awkward form. And no one ever surpassed Spencer in dressing his discussions and arguments with captivating terms, and beautiful and symmetrical expressions and sentences; but unfortunately very often these terms, expressions and sentences are so indefinite and so ambiguous, that they are more apt to mystify and mislead than to elucidate and point out correctly.

His great law of evolution, in accordance with which “all the changes in Nature, since the earliest traces of cosmical time down to the present day, have been effected,” like his great definition, is so incorrect, so vague and indefinite, that its practical application to any particular case becomes ridiculous. Take for example the organization of an animal, and apply this law to the operation, and you will have the following statement: This animal is a product of evolution, and was produced by “an incident force falling on an aggregate that contained like and unlike units, which segregated the like units and separated the unlike.”

The absurdity of this statement demonstrates that all the varied modes of Nature's operations cannot be formulated into one general mode, and that a law which *includes everything in general is applicable to nothing in particular*.

The mistake in Spencer's elaborate generalizing is this, that while he carefully systematized and unified the results of Nature's operations, he failed to note the distinctive modes of those operations, and consequently the general features of Nature's activities and their results are fully and fairly stated and brought into view; but the distinctive features in the various modes of action—the *special laws of Nature*—the great points of scientific interest, are over-looked, and are obscured by the mist of generalization, and by minute details of particular cases from which general conclusions could be drawn.

The result is, that his great law is not only inapplicable to any particular cases, but that it is incorrectly stated, and is entirely out of relation with the actual modes of Nature's activities, and the results of Nature's operations.

The statement that a force *falls* is a mistaken one. General forces such as attraction, repulsion etc., exist everywhere, and wherever the conditions are favorable they manifest action. Localized forces act within the material that contains them; hence there can be no “falling” of a force and it is a misstatement which should not be made in defining a great law of philosophy.

“An aggregate” in the statement of this law unquestionably refers to matter, so that the

"units contained in the aggregate" must be units of matter. A unit is the term in which the *least one part* is expressed, without any regard to sameness or difference; and the distinction between "like and unlike units," applied to an aggregation of matter, is a distinction without a difference, and is as utterly undefinable as the difference between *one and one*, for that is exactly what it means. The units of oxygen, hydrogen and nitrogen are all alike units. They are not "like units" of oxygen, and "unlike units" of hydrogen or nitrogen.

If we *suppose* that Mr. Spencer in formulating this law, had in view the theoretical centres of attraction, or of formative action, we are met with the same difficulty, for centres of attraction or formative action are *supposed points* where action commences, without any regard to likeness or unlikeness. In fact they are *supposed not* to have any qualifying characteristics whatever; so we are "left in the dark" as to what this great law means, or what Mr. Spencer had in view when he formulated it. The very gist of it is meaningless. *It points to something but it shows nothing*; and thereby mystifies and misleads. The reader is misled by the familiar terms "like and unlike" which are applicable to every known thing and characterize nothing; and by the application of the common mathematical term unit to matter, not as a basis of mathematical calculation, but as *data* of philosophical principles, without any qualifying relations, so that it stands alone like the "figure 1, and is as meaningless. Units however are qualified by the unqualifying terms "like and unlike" so as to create the impression that *they are things* composed of various substances, and containing different properties.

A fundamental law of First Principles, so imperfectly and incorrectly stated as to make it meaningless, and to mystify and mislead, cannot be of much force. But as human laws are not always perfect, even when made to represent the perfect laws of Nature, we must construe this law of Spencer's in accordance with its most probable intent. The most probable intent of the expression "like units" is that it means units of like substances.

The operations of the forces of Nature show results in the mineral world that indicate modes of action directly the opposite to Mr. Spencer's great law. These results fail to show that the units of like substances were set apart and the units of unlike substances separated, but they do show, on the contrary, that the units of unlike substances are united together; for nearly all mineral formations are composed of a union of different minerals. The atmosphere, water, rocks, minerals, almost without exception, and all the changes in the mineral "kingdom," from the gaseous state, to that of its present limitless variety, are all combinations of different substances. It is, therefore, apparent that the combination of the units of different mineral substances is the general mode of Nature's operation in all the processes of mineral formation; and that the segregating of the units of one substance—for there are no two "like" elementary substances—is the exception. Affinity refuses

to segregate the units of a single substance; but when it draws together the units of different substances to form a mineral combination, it sometimes leaves the units of one substance alone; and that is, perhaps, the only reason why minerals are occasionally found in their native state. We are told that "the law of *organic* evolution is the law of *all* evolution," that is, the law of evolution is the same in all the operations of Nature. According to this law, vital force builds plants and animals by "segregating the units of like substances," and as there are no two elementary substances alike, it can segregate but one substance; and, therefore, all plants and animals must be constituted of one substance. The operations of Nature in vegetable and animal life, show directly the opposite results of those produced by Mr. Spencer's great law.

Nature's plants and animals are composed of different kinds of substance. In each of the more complex animals a large number of substances, in unequal proportions, are combined together in structural forms, and all organized into one whole. But we are told that the units of the different substances contained in this whole are each segregated—set apart. Even if this would be correct it would still be an organized body composed of different substances, and would show that these substances were all used in the organic construction.

There is, however, hardly a namable part in the whole body of any of the more complex animals, that does not contain more than one substance. A single hair of a human being contains among other substances magnesia, iron or other coloring matter, and oil, and even this oil is composed of different constituents.

That this great law does not accord, and is wholly at variance, with the regular mode of development in Nature, has been made apparent by the facts shown, that the operations in mineral formations, and the progressive growth of plants and animals are processes of combination, and not segregations of the units of like substances and separations of those of unlike substances.

Mr. Spencer, in explanation of his law, states that "when the parts of an aggregate have been made qualitatively unlike by unlike incident forces—that is, they have become contrasted in the nature of their component units—there necessarily arises a tendency to separation of the dissimilar orders of units from each other, and to aggregation of those units which are similar." In this brief explanation Mr. Spencer's remarkable talent and expertness in the use of words and expressions, in the confounding of fact with uncertainties, in the transposition of things and principles—of matter and force—and in misapplications and misstatements, are fully displayed. He uses the word aggregate without reference to any particular thing, leaving the reader to infer whatever occurs to the mind and to make his own reference.

His statement of making the "parts qualitatively unlike by unlike incident forces," not only conceals the *kind* of aggregate, but applies an operation to the parts which never

takes place in an aggregate of matter—the only kind of an aggregate that can be rationally assumed in connection with the subject under discussion. Neither like nor unlike forces every change, the “quality” of the parts in a mass of matter. Chemical force may effect a transformation among the parts in a mass of matter, through dissolution and recombination; but then the *new* combinations, or parts, are no longer the *old* parts. They are a new creation. The old parts must be destroyed before they can be changed. A change means a re-arrangement of the parts and not a change in their nature. Such a thing as a qualitative change in the parts of a mass of matter, without a change in the arrangement of the component parts, either by the infusion of something else, or by a re-arrangement and recombination, is not known in Nature. There may be dissolution and re-distribution, but unless there is a re-combination there can be no change in the quality of the parts; and these parts therefore, cannot “become contrasted in the nature of their component units.”

Nature transforms by re-arrangement and recombination, and this necessitates a dissolution of the former combinations. Forces do not infuse their peculiar qualities into the granite, the limestone, the sandrock, the kaoline, and other mineral substances that constitute a mass of matter, and even if the forces permeate every part of such a mass, they do not effect a “qualitative change in the units” of any part.

The expression “orders of units,” as it stands, without a qualifying relation, is meaningless; and even if the term units is taken to mean small parts, or atoms, or elementary constituents, the sentence in which these words are used, would still be too vague for an explanation, and would *not be a statement of facts*; for there never is in matter, nor in its parts, any tendency to move, much less is there a tendency to move by “like orders of units,” (constituent parts) in one direction and by “unlike orders” in another direction.

Nearly all the minutely detailed examples given in explanation of the operation of this great law of evolution, are examples of *dissolution and re-distribution*, but they are most ingeniously applied to evolution.

The examples given of the full-winds carrying away the dead leaves, and leaving the green on the trees, of the winnowing of the wheat from the chaff, of the disintegrating and dissolving effects of water and its agency in irregular re-distribution of the disintegrated and dissolved material, are all cited as examples of “a change from an indefinite, incoherent homogeneity to a definite coherent heterogeneity.” Then follows the explanation that this process of “segregating the like and separating the unlike parts,” in the examples given, is due to the *contrasted nature* of the component parts in the aggregates which had been made qualitatively unlike by unlike incident forces.” In the example of the wind carrying away the dead leaves and leaving the green, the green leaves would probably be the “like units,” and would be set apart, and the dead leaves would be the “unlike units,” and would be separated, except in case they would be blown into a fence corner, then the application of the rule might be reversed.

In the example of the re-distribution of matter by water, if the matter was washed down a mountain, the largest and heaviest stones would be first dropped, and should be the “like units,” and should be set apart; the gravel deposited on the way to the level would be a little difficult to classify. The *mud* that would be carried down to the level and deposited in an eddy would be the “*unlike units*,” and would be separated.

Mr. Spencer over-looked the fact that air and water are matter, and not forces of Nature; and that consequently the effects and results produced by moving air and water are due directly to matter acting on matter, and are not such effects and results as the direct actions of forces in matter produce. In capillary attraction, and evaporation, and in the rising to the surface of materials lighter than water, the effects and results produced by one kind of matter acting on another are just the opposite of those produced by the direct action of forces in matter. Attraction is always the same, and always draws towards the earth in our sphere, but its effect on different kinds of materials makes the action of such materials on each other produce directly opposite effects and results, from those produced by the direct interaction of force and matter. Hence a law of Nature formulated from the effects and results of the action of unlike materials upon each other, would be, in the cases referred to, exactly the reverse of the universal mode of action by the forces of Nature in those operations. These facts escaped Mr. Spencer's notice, and he failed too to observe the distinction between the operations and results of “differentiation and integration,” and those of dissolution and re-distribution; or rather he confounded these two directly opposite processes, and formulated his great law so as to include both; and the result is, that his law is a failure, and applies neither to evolution, nor to dissolution, nor to any of Nature's operations.

LEBANON, PA.

IN WHAT SENSE, AND TO WHAT EXTENT, IS CONSCIENCE OUR GUIDE?—NO. 1.

BY REV. JOSEPH SMITH.

As the conscience is that faculty of the soul whose special function is to take cognizance of moral truths, it is often affirmed that the voice of conscience is the voice of God, and hence is an authoritative standard on all questions of right and duty. But do facts warrant this idea?

By a law of our nature, we accept what we believe to be right, and reject what we believe to be false. But in this matter we are liable to be sadly deceived; for some ingenious canard may as readily secure our assent as a veritable truth.

Men once as firmly held the Ptolemaic, as they now do the Copernican theory of astronomy. The Jews as fully believed in a temporal as we in a spiritual Messiah. And the Catholic as honestly condemns the reading of a Protestant version of the Bible as we approve the act. Hence our decision on any subject will vary with the nature of our information on it, or the thoroughness and candor with which we ex-

amine it. This is as true in ethics as in science, history, or testimony.

The decisions of conscience will be right or wrong on any given question, according as it is correctly or incorrectly instructed on that subject; and will change with every change in the amount of light or darkness that is shed upon it.

When one trained a Catholic emerges into the light of Protestantism, his conscience reverses its decisions on a variety of subjects; and when one, trained in the truths of Protestantism, comes under the power of Catholicism, his conscience also alters its voice, and approves what it before condemned, and condemns what it before approved.

But it is thought there are at least some truths which naturally inhere in the conscience, and which are common to all men, and, therefore, not liable to perversion. But this position must submit to important modifications.

There are, indeed, certain propositions, whose truth is self-evident to the mind apprehending them. But not all, even of these truths, command universal assent. That the whole of a thing is greater than its part, or that a triangle is not a square, all at once admit. But that governments are for the benefit of the governed; or that liberty is essential to accountability, has not been universally accepted; for even self-evident truths are not free from the influence of mental bias.

It is the same with all moral truths. No truth, whether moral or scientific, is innate, or born with us. Hence, the only sense in which any truth can be said to be "written on the heart" is that there is a special aptness for receiving it when presented to the mind. But with all its affinity for ethical truth, it is very doubtful if the moral sense is able to *evolve* any such truth; and it certainly fails to give permanent shape to such truths, even when once presented to the mind.

If the voice of conscience is the voice of God, then the first act of the moral sense would naturally be a recognition of the being and character of Him who is speaking through it. And moreover, the being of God is a fundamental truth from which springs all moral truth. Then if the moral sense is able to evolve any truth, and hold it in definite form, it must be that of the being and character of God. Then let us see how the conscience has dealt with these truths.

Many facts show that no one has any idea of God until he is taught it. This fact can be most satisfactorily learned from the case of deaf mutes.

The deaf and dumb shepherd boy of Bordeaux, taught by Sicard, was wholly ignorant of the existence of God till his teacher communicated the thought to his mind. So, also, was the deaf young man of Chartres, who, at the age of twenty-three, suddenly recovered his hearing. And so also was the Irish lad taught by Charlotte Elisabeth. And as the Directors of the Deaf and Dumb Asylum at Hartford, after many years of observation, say in their report that "all the experience of the Asylum serves to establish the fact that, without instruction, the deaf and dumb are never led, by the consciousness of their own intellectual op-

erations, or by the contemplation of the works of Nature, to even a glimpse of the immortality of the soul, the existence of God, or the accountability to Him."

Dr. Lindley, for forty years a missionary among the Zulus, said he could not discover the faintest trace of the idea of any kind of a god in the minds of the untaught natives. The same is true of other large tribes of savages.

Now these and other like facts prove that the conscience does not evolve the most fundamental ethical truth,—that whatever its aptness to receive this truth, it must first be taught it in order to apprehend it. And this shows that the fact of God's existence must have been at first communicated to man by revelation, and that it has descended to succeeding generations by tradition. And this is further shown by the fact that the farther back we can trace the religion of the leading nations of antiquity, the nearer their ideas approached to pure monotheism, and the more rational were their theological views.

Nor is it at all probable that the idea of a self-existent God has been learned simply through the intuitions of reason. The idea of a creator of the world would be much more likely to come from the *revealed* fact of an eternal God, than would the idea of God from the conviction that the world must have had a creator. So profound is the mystery shrouding the origin of being, and such the ready credence given to the eternity of matter and the wondrous feats of Nature's inherent forces, that there would be little chance that the reason any more than the moral sense, when enveloped in these mysteries, would grasp the idea of God. We know it has failed to do this in the case of deaf mutes and many others; nor have we any proof that the reason, wholly unaided by the light of revelation, has ever taught this idea to any one else.

Again, this affinity of the mind for moral truth is not only not strong enough to evolve the idea of God; but it is not always strong enough to retain that idea after once receiving it. The ancestors of the Zulus undoubtedly once had the traditional knowledge of God, like the other pagan tribes around them, though that idea has entirely faded from their minds. And, indeed, this is said to be the case with a Portuguese colony, whose ancestors were trained in the truths of Christianity. If conscience deals thus with the *being* of God, it deals far worse with his *unity, character, and worship*.

These are matters of vital moment to men; for infinite interests depend on our having right views of God's character, and offering him an acceptable service. Now, if there is any divinity in the moral faculty, any voice there uttering the truths and will of God, we should certainly expect it, when speaking on matters of such vital importance, to teach the same truths alike to Jew and Gentile, Christian and Pagan. We certainly should not expect it to teach one man to believe in only one God, and another to believe in many—even millions of gods. We should not expect it to lead one man to believe in a God of purity, and another in gods of pollution and crime. It certainly would not instruct some to worship God with clean hands and a pure heart,

and others to worship their gods with rites the most vile and revolting.

Yet forms of religious belief and practices the most erroneous and the most conflicting, are held by men evidently with as much firmness and honesty as were his anti-Christian views by Saul of Tarsus, or as are the dogmas of Rome by her devotees.

The nations having once been made acquainted with God, glorified Him not as God; but became vain in their imaginations and their foolish hearts became darkened. And not desiring to retain God in their knowledge, they changed the truth of God into a lie, and worshipped the creature instead of the Creator. And thus fearfully have "their mind and conscience become defiled," cauterized, seared with a hot iron.

Thus unreliable and misleading is conscience when dealing with the *first* table of the law. And it sheds the same uncertain light on the precepts of the *second* table. There, is, indeed some idea of right and wrong among the most darkened and degraded, as there is the idea of truth and error among the most ignorant. But the recognition of the difference between truth and error is one thing, and the fact as to what *is* truth, and what *is* error is quite another. So one may recognize the distinction between right and wrong, and yet be sadly in the dark as to what really *is* right and what *is* wrong. Let us glance at some of the notions of right and wrong, that prevail among men.

The most debased and savage approve of acts of kindness to their kindred. But this feeling evidently springs rather from the instinct of kinship than from the moral sense. They would also condemn the killing or robbing of one of their own clan or nation. But this is obviously the dictate of mere clannish or partisan selfishness; for beyond the limits of kinship and clan they rob and kill apparently without any scruples of conscience. Indeed they believe their gods approve such acts; and they invoke their aid in their feats of war and plunder, and other deeds of wickedness and horror, and even deify those most noted for their deeds of rapine and blood. Even the cultured Jewish doctors, favored with the instructions of the Old Testament scriptures, while teaching the obligation to love their neighbors, taught also the duty of hating their enemies, and all not members of the commonwealth of Israel, they regarded and treated as "dogs."

When it is thus in the comparative green tree, what can we expect in the dry?

While having some dim notions of right and wrong, the heathen conscience seems to have been largely shaped by considerations of personal interest, of kinship, of social or national utility, and by blind or crafty teachers. But by whatever means their notions of right and wrong have been formed, or however false their notions, they accept them as their moral standard. Hence the crude jumble of truth and error, of sense and absurdity exhibited in the ethics of the heathen world.

Nor is this moral blindness confined to the lower and more ignorant of these nations. Even the learned philosophers of Greece and Rome were about equally in the dark. This blindness is conspicuous in their different

views of the *chief good*. Cicero, speaking on this subject, says that "those who do not agree in stating what is the chief end or good, must of course differ in the whole system of precepts for the conduct of human life." And yet he says that on this point "there is so great a diversity among the philosophers that it is almost impossible to enumerate their different sentiments." Fletcher, who had examined two hundred and eighty-eight of these theories says that "not one of them made the chief felicity to consist in the knowledge and enjoyment of God." They were every one of them wrong, even on this most vital ethical truth, and were each shaping his course by a wrong system of ethics.

Such a babel of discordant utterances does the native conscience exhibit even on this fundamental subject, to say nothing of its conflicting utterances on the thousand other points of ethics.

As a guide, when uninstructed by revealed truth, it is about as unreliable as a weathercock, now leading this way and now the opposite, uttering through one man its approval of a given course, and through another its condemnation of it.

Nor is the conscience in Christian communities essentially different from what it is in pagan lands. It is of the same stuff and substance in one man as in another, and in its native state is as purblind and as easily duped in New England as in New Guinea.

BANGOR, ME.

(Concluded next month.)

IS CONSCIENCE AN INNATE FACULTY OF THE HUMAN SOUL?

BY MRS. M. S. ORGAN.

In all ages, and in all stages of civilization, mankind has had a consciousness of a principle or force within, inciting it to do right, or at least, a power to perceive that there is a right and a wrong. This power or attribute is termed conscience.

The real nature and function of this faculty, has ever been a source of perplexity to metaphysicians, theologians, and scientists; and despite all their research, and the learned dissertations which they have given to the world on the subject, it is involved in as much obscurity and mystery as ever; for their conclusions are not only widely divergent, but often diametrically opposite.

Some affirm that conscience is a simple, innate faculty of the soul, and enables its possessor to incisively draw the lines of demarcation between right and wrong, virtue and vice, justice and injustice.

Starting upon this premise, they enthrone it as the sole arbiter—the absolute dictator of all moral action—the inborn rule of right, which each individual is in strict duty bound to obey; and as a necessary corollary, has the natural and inalienable right to full and unrestricted liberty in all matters of morality.

On the other hand, equally sincere and competent investigators maintain that conscience is not an innate faculty, but is wholly the result of education and environment. All adherents of the Darwinian theory of evolution, take as

the logical sequence of that theory, the position that conscience or the moral faculty is not in any sense inherent; that it has been evolved through the associated action of the social and intellectual faculties, or is the result of intellectual culture; and therefore the higher the degree of culture, the more acutely developed and clear in its perception will become the power of conscience. To substantiate their position, they bring forward the well authenticated facts in the history and development of the race.

Beginning with the lowest or savage condition of mankind, they show that in this stage there was scarcely a perceptible action of conscience; then coming on up in the scale to nations who had reached a plane of civilization, such as the Phœnicians, Persians, Carthaginians, etc., they show that even in this advanced condition, conscience did not prevent them from committing the atrocious deeds of burying human beings alive, and burning their own children. Passing to the mediæval age, they point to the undeniable fact, that conscience then approved the persecution and martyrdom of millions of individuals for their religious belief. Coming on up to the eighteenth century they show, that with all the advancement in culture and morals, conscience sanctioned the burning of thousands accused of witchcraft.

Making a summary of civilization, they show how one generation would, with a conscientious sense of duty, perform deeds, which in the next would be regarded as the most horrid cruelty. They therefore affirm that all historic facts, and all human experience demonstrate that conscience is nothing established, or innate; but something varied and acquired; and as such, is but an expression of human knowledge and culture—that as knowledge is increased and disseminated, in a corresponding ratio will conscience become more developed, more clear and more penetrating in its perception, more refined and tender in its action, more liberal to all in their convictions, more willing to extend the hand of fellowship to those whose opinions are even at antipodes.

But these theorists assume as *fact*, that which has never been conclusively proven, viz. that conscience (the moral sense) or *any* faculty of mind has been *evolved*. Education and environment can, and do develop powers of mind; but all the scientific facts that have been collated, have most signally failed to furnish any data to prove the evolution of a single faculty of mind, either in man or the lower animals. All the facts revealed by physiological and psychological science demonstrate that the germinal principle, or elemental faculty must exist before it can be unfolded or developed.

The primal difficulty with all theologians, metaphysicians and evolutionists is, they have wholly mistaken the nature and function of the moral faculty; they make no distinction between it and conscience; they recognize them as one and the same, using the terms interchangeably; whereas, they are radically distinct both in their nature and origin.

Conscience is not a simple or innate faculty; it is a complex product; and as such is wholly the result of education; and, therefore, cannot with certainty be a definite rule of right. But the *moral sense* is an innate faculty—a consti-

tutional element in the mental organism. In no degree is it the result of education or environment; nor can it be educated in any way, only in the sense that it can be quickened into action, and through this action acquire greater intensity, strength and vigor. Under all circumstances, in all conditions of society, whether savage, civilized, or Christianized, it remains ever the same simple, native moral sense; and its sole function, its only power is to incite the individual to *do right*. Yet in, and of itself it has no perception of what *is* right—no power whatever to determine it; that depends entirely upon the *intellectual faculties* acting under its stimulus, and whatever these faculties acting under the stimulating power of the moral sense decides to *be right*, the moral faculty receives as right.

The legitimate and only function, then, of the moral sense is to incite the intellect to search for truth, for justice and right on every subject presented to the mind for consideration and decision; to weigh all evidence with the strictest impartiality; and the more vigorous and refined the moral sense, the greater force it brings to bear upon the intellectual faculties, urging them to be faithful, diligent and persistent in their efforts to determine what is right.

When the intellectual faculties, acting thus under the impelling force of the moral sense, arrive at a conclusion, that conclusion is accepted as a finality by the moral sense; it has no capacity whatever to discriminate as to its accuracy or inaccuracy, and such is not its province; having exerted its legitimate and sole function in stimulating the intellectual faculties to do right, it acquiesces in whatever decision at which they arrive with a normal satisfaction. And this conclusion, which is the result, or complex product of the action of the moral sense on the intellect, and the intellect on the evidence objectively and subjectively presented, becomes a fixed and determinate moral sentiment of the mind, and is so directly associated with the moral sense as to become a dictum whenever this innate faculty is called into action in reference to any decision that has thus been educed; and this definite moral sentiment—this product of complex action—is what is denominated *conscience*. Being a complex result, it is easy to perceive how one generation can conscientiously perform actions which another would as conscientiously denounce as unjust and criminal—how, even in individual experience, positive moral convictions will change as new light and different evidence are presented to the mind.

But through all this change of conscientious conviction, the *moral sense* undergoes no variation whatever; under all conditions and circumstances it is the same simple force, and its unerring, positive, and only language is, *be right! be right!*

The subject may perhaps be more clearly elucidated by an illustration:

No one with a mind unbiassed by prejudice, can dispute the fact, that John Calvin was a man of strong moral sense; that he was rigidly conscientious in his actions; and yet to us, in this liberalized light of the 19th century, his act of approving of the burning of Servetus seems an unmitigated cruelty.

How, it is asked, could a person of conscientious conviction approve of such an act? Let us bear in mind the fundamental truth—the scientific fact—that conscience, is a complex product; that it is the result of environment and education. The religious teaching in the day and age of Calvin, was, that a belief in certain theological doctrines was essential to salvation; not only was such the inculcation of that age, but of many preceding; and this teaching had been transmitted as a legacy of faith and knowledge from one generation to another, until it formed the very substratum of religious doctrine. When the question in regard to Servetus was presented to the mind of Calvin, his active, vigorous moral sense at once asserted itself, uttering decisively its simple and only language—*be right! be right!* His logical intellect acting under this impelling force took up the proposition, critically weighed and examined all the evidence presented; but the strong bias of education and inherited belief had its powerful influence in deciding the vital issue. Believing as he did, that the salvation of the soul depended upon the unqualified acceptance of the dogma that Christ was the eternal Son of God, he decided it was for the eternal interest of humanity, that Servetus should die; for if he should continue proclaiming his doctrine that Christ was not the eternal Son of God, but only the Son of the eternal God, it would be the damnation of all who embraced it; and therefore it were better that one individual should die, than that many souls should be lost through his pernicious doctrine. This decision, arrived at through this mental process, became to Calvin's mind a fixed moral sentiment—a *conscience*, and would act as a dictum whenever the moral sense was appealed to on this question.

But transplant John Calvin to this age, let such a proposition as the burning of an individual for teaching religious tenets which antagonizes his idea of saving belief, be presented to him; his strong moral sense would still utter with imperative force, its simple language, *be right! be right!* But truths born out of the throes of struggling humanity—the accumulated knowledge of centuries, would be forcibly pressed home to his mind—the grand primal truth that every human being has the inherent, God-given right to unrestricted liberty in all matters of religious faith; that a belief in any religious tenet is not absolutely necessary to salvation; that true religion consists in the practical exemplification of the precept, "Do unto others as you would that they should do unto you;" these, and similarly correlated truths, would break with a clear and strong light upon his understanding; so that, in weighing the evidence, his decision would be, his fellow-man was not only entitled to life and liberty, but also that a true Christian spirit demanded that charity, love and forbearance be extended to him. And thus a very different moral sentiment, or conscience, would become established in his soul.

Having these scientific data in regard to the real nature and function of the moral sense, and thereby being enabled to comprehend the true philosophical distinction between its action and that of conscience, we can readily understand how the conscience of an individu-

al may at one time tell him that it is right to do a certain action, and at another time, through the influence of different surroundings and education, may tell him that it is right to do the very opposite.

While the moral sense cannot in any measure be educated, yet like all other faculties of the soul it can be increased in strength; and as it will become more refined in its elemental constituents by being brought into normal and vigorous action, it will become degenerated and paralyzed through inaction or restriction.

When an individual allows the force of hate, love, revenge, pride, ambition, acquisitiveness, or the animal propensities to dominate, overpower, or stifle the voice of the moral faculty—to depress, or in any way restrict its normal activity—a weakening and dwarfing of it, organically and functionally, will inevitably follow;—the individual will become morally emasculated—psychologically speaking, a *moral idiot*.

Action—vigorous, duly-regulated action—is what every faculty of soul and organ of body imperatively and unconditionally demand for healthful and symmetrical development.

NEWBURGH, N. Y.

FREE AGENCY AND FOREKNOWLEDGE.

BY COL. JOHN M. PATTON.

Since June last your columns have contained successive articles discussing again, in substance, the old question of "Free will, fixed fate, foreknowledge absolute," whose din has resounded through the centuries like a Chinese gong. On this subject the mind of the world has been wearied with the "jargon of the schools," and its ear deafened with their seemingly unending logomachy. In this ceaseless war we had reason to hope for a peace, and seemed to have obtained something like a truce, when Dr. Bledsoe in his immortal work a "Theodicy"—apparently crushed, with his gigantic blows, the old *Calvinistic Predestination and Retribution* notions. The reaction against this terrible old "Giant Despair" seems now, however, to have gone so far that it may well fear lest the pendulum of sound judgment may, either in its forward or its backward sweep, swing from its pivot, and leave us in a gloom almost as dense and hopeless as that from which we seemed to have emerged. Dr. McCabe's discussion of what he calls the "Divine Nescience," followed by the successive articles in your columns by Prof. Kephart seems to mark this phase of the pendulum in one direction; and the recoil from such a possible disaster in the successive articles of Rev. T. Williston seems again to have sent it back, in the other direction, even into the dismal regions from which it had been attracted.

It is scarcely possible to conceive of a more extreme antithesis than that between the Divine "Nescience" and the Divine Predestination.

It is a great comfort to believe, however, that the truth is rarely if ever found in either of two extreme statements on any given subject; she is never on the extreme frontiers of the great battle of life; but nestles sweetly in some sacred place, protected on every side—herself

the centre to which all diversely-expanding lines converge, the precious resultant of all contending thoughts. There must, therefore, be some middle ground between God's supposed ignorance that any sin will to be continued in the future, and His consequent irresponsibility for the creation of a free agent on the one hand; and His certain knowledge of such inevitable sin, and consequent fore-dooming the helpless creature of His hands, by the act of creation, to an endless torture on the other. Let us seek to find that middle ground.

Dr. McCabe's argument was thus answered by a very accomplished and distinguished literary lady in a letter to me—"Foreknowledge, to my mind, is a part of God; and no more affects my free-agency than this does which, I give * * * as an illustration. 'I offer my son a sail-boat or a pair of horses. I use no influence, but so thoroughly understand him, and know his character, that I have no hesitation in building a *stable* for the horses, while my son supposes he is making up his mind. I *know*, but I do not destroy his free-agency.'" This argument is "in a nut-shell," and seems to be sound. "*Rem tetigit acu.*" It is also an argument employed by Dr. Johnson on the same subject, quite as tersely. In 1778, when he was in his sixty-ninth year Dr. Mayo and Boswill, who had both lately read "*Edwards on the Will*"—though Johnson had not—set at work that wonderful mental condensing machine of his, thus—

Boswill: "It puzzled me so much as to the freedom of the human will, by stating, with wonderful acute ingenuity, our being actuated by a series of motives which we cannot resist, that the only relief I had was to forget it."

Mayo: "But he makes the proper distinction between moral and physical necessity."

Boswill: "Alas! sir, they come both to the same thing. You may be bound as hard by chains when covered with leather, as when the iron appears. The argument for the moral necessity of human actions is always, I observe, fortified by supposing universal prescience to be one of the attributes of the Deity."

Johnson: "You are surer that you are free than you are of prescience; you are surer that you can lift your finger or not, as you please, than you are of any conclusion from a deduction of reasoning. 'But let us consider a little the objection' from prescience. It is certain I am either to go home to-night or not; that does not prevent my freedom."

Boswill: "That it is certain you are *either* to go home or not does not prevent your freedom; because the liberty of choice between the two is compatible with that certainty. But if *one* of these events is certain *now*, you have no *future* power of volition."

Johnson: "If I am well acquainted with a man, I can judge with a great probability how he will act in any case, without his being restrained by my judging. God may have this probability increased to certainty."

Boswill: "When it is increased to *certainty*, freedom ceases, because that cannot be certainly foreknown which is not certain at the time; but if it is certain at the time, it is a contradiction in terms to maintain that there can be afterwards any *contingency* dependent on the exercise of the will or anything else."

Johnson: "All theory is against the freedom of the will; all experience for it."

I venture to think that this contains about the essence of the whole discussion; and that any attempt to reach certainty on such a subject, where the material for investigation is not in our possession, must continue to end, as it always has done, in "vain disputations"—in fact, mere gabble. Let each "be fully satisfied in his own mind," not so much by reason as by intuitive perception, and by faith based on the general and special teachings of Scripture, that He who marks the sparrow's fall; that He who numbers the very hairs of our heads; that He who says of himself, "I am God, and there is none else; I am God, and there is none like me; *declaring the end from the beginning*"—*knows* what you and I will do, either good or bad, as well as He did what Cyrus would do, what Assyria, Persia, Greece, Rome, or Egypt would do, what His people Israel would do. But we may be equally sure that He will not, whether He knows the future of free-agents or not, necessitate their evil action, and so predestinate them to ruin.

It is true that those who maintain the "nescience" of God as to the future action of free-agents, are struggling, just as the old Arminians did, to vindicate the justice and glory of God on their respective theories; but it is unfortunate that *such* theories should be needful for them. The false premise of a hopeless future punishment creates the necessity, in all these forms of speculation, to search for a theory that shall vindicate the holiness of a Creator, who either by eternal decree foreordains his helpless creature to ruin, or creates him, knowing that by this very act he will *certainly* be ruined.

On sound premises there is no need of these vain speculations, or these hideous alternatives. On *sound* premises, the justice, beneficence and glory of God shine out, not with the splendor of the sun alone, but with that of the ineffable light that surrounds the eternal throne of the universe itself—before which all earth-born clouds and shadows flee away forever.

In view of the chaos of vain speculations and opinions on this terrible subject, well may Prof. Kephart, at the close of the able part taken by him in the discussions, use the following language: "The teaching that God voluntarily brings into existence human souls, knowing *certainly*, and *beyond the possibility of its being otherwise*, that they will writhe in hell forever, has made, and is now making, more infidels than all the books that Paine, Voltaire, and the whole infidel brood have ever written; and until the churches so change their theologies as to rid them of this damning blot, they might as well close their doors. In these days of enlightenment an eschatology is demanded that will stand the test of sound logic, actual justice and goodness, and plain, practical common sense."

True, oh master! but such an eschatology will not include God's "nescience" as the excuse for that dismal fate, nor any theory that even *permits*, ultimately, such an awful doom; and therefore I venture to suggest such an eschatology as will satisfy the conditions so well stated by Prof. Kephart.

1st. God made the universe for *His own glory*, which is so inseparably connected with the temporal and eternal happiness of His creatures, that without that happiness it could not exist.

2d. God foresaw that evil, both in the general and in the particular, would certainly result from free-agency, and mar that glory.

3d. To prevent that evil from being absolute, and to make it relative and temporary only, and thus to restore that glory, He necessarily provided, *prior to the act of creation*, a remedy for that evil of so stupendous a character, and of such a divine, ameliorating efficacy, that he foresaw it would be sufficient to accomplish that result, and that without that remedy *creation would be impossible*, because *inconsistent with his perfections*.

4th. That in consequence of the all-persuasive and all-sufficient power of that remedy, evil shall not triumph over God *in any case*, but He shall triumph over evil in *every case*—else evil would itself be God, or equal, at least, with God.

5th. That, as a result, there will ultimately be a purging of all evil from the universe, and a reconciliation of that entire universe with all its free-agents to the love and favor of God.

6th. That the means to this end will be repentance of every free-agent, either now or hereafter constrained to it through the all-conquering love of Christ; for,

7th. Death—in the high Scripture sense—is not the mere dissolution of the flesh—"to be *carnally minded* is death"—and as repentance *after this death* is possible *here*, so it is possible *hereafter*. The dissolution of the flesh does not destroy the faculty of repentance, because it belongs not to the body, but is an essential faculty of the soul, without which it would be no soul at all.

8th. So, as the sufferings of our probation here bring many as willing penitents to Christ, the greater sufferings and the clearer view of spiritual things hereafter will bring *all* as willing penitents to Him at *some time* in the future. Then he will deliver up "the kingdom to God, even the *FATHER*," and "God shall be *all in all*."

On these premises—drawn not from the wisdom of man, but, as I believe from sure warrant of Scripture—the glory, beneficence and love of God can be shown forth even in connection with evil—with the sins and sorrows of this otherwise strange and mysterious life.

At the risk of being suspected of the trick of the patent medicine men—who beguile us by discussing some other subject into reading an advertisement—I dare to say that the propositions above set forth, and others, are all covered by the book you advertise in connection with *THE MICROCOSM*—"The Death of Death"—of which I am the author. To shield myself against such a poisoned arrow, should it be thrown, I further state that I neither expect nor desire to make any money by that book, so that my motive in here alluding to it is, at least, not sordid. I only desire it to be circulated as one humble contribution towards the solution of the Divine and human mysteries by which we are surrounded.

This book was reviewed in the *Southern Presbyterian Review*, of Columbia, S. C., by a distinguished Presbyterian D. D. and professor in one of the theological schools of his church. If I should mention the name of this professor it would be recognized as a household word throughout the country, both north and south, for purity and ability, even by those who might most differ with him. I hope I may be permitted to add that he is a very dear and intimate friend of my own. One of his criticisms on the book appears in an extract from a letter addressed to him, which I set forth because it bears on the discussions in your columns. It is as follows: "*Fourth*: You truly say (p. 483) that the 'author thinks he has a true Theodicy,' on the theory of the 'Death of Death,' and add, 'alas! that this also should be demolished as quickly as the other' (Dr. Bledsoe's theory.) You then say, 'If God's end in the creation of the universe is belittled as his (the author's) whole argument assumes, then why did he not refrain from creating all such souls as he foresaw would require these frightful means (present and future punishment) for their final restoration, and stock his worlds with only such souls as would follow holiness and happiness, like the elect angels, without being driven into them by this fiery scourge? Surely the author will not attack God's omnipotence by denying that He was able to do the latter.'" The reply to this was—"God forbid! He (the author,) fervently believes that God's power is only limited by his perfections, and that He can do everything that pleases His blessed will, except that which involves a contradiction—contrary to His nature—and that He cannot *will*. Now it would have been *no contradiction*, had He so chosen, to create endless multitudes of happy beings incapable of sin. In fact, He has done it, so far as temporal happiness is concerned, in the birds of the air. So He might have made *immortal* beings incapable of sin; but they would have been only *immortal animals*. So it would have been *no contradiction* to have confined His creation to those whom He foreknew would not sin, though capable of it, or to those whom He foreknew would repent of it in this world. When, therefore, the author is asked, or it is assumed that *he should* ask, why God did not do so? he replies (a) that *in point of fact* God has not confined Himself to such creatures; and that the author's effort has been to show that the creation which He has *in point of fact* ordained, with all its sins and sorrows, is consistent with His holiness. (b) In the effort to maintain this, he has endeavored to show that God's creative energy *must* be exerted in *infinite* variety; and that if in the display of this infinite variety there be any creature whose nature may or *must* be disciplined, chastened and improved by trials and afflictions, including sins that are repeated of, such a creature will be a nobler and *happier* one, after such an experience, than one of the same degree of excellence, whose virtue is a mere implanted or *machine virtue*. (c) That God's holiness in no manner conflicts with His making such creatures, but is, on the contrary, exalted by it—provided that these sufferings are only *temporary*, and will end in the enhanced and eter-

nal felicity of the creature—for on these conditions the ‘ministry of sorrow,’ as the author calls it, or ‘the woes of earth and hell,’ as you call them, are *good* and *not* evil. So that if we had, as you say, ‘a universe *minus* all the woes of earth and hell,’ we should also have one *minus* the brightest bliss of heaven—that bliss which is enhanced by experienced sorrow and made ‘perfect,’ like our blessed Lord, ‘through sufferings.’”

BENTIVOGLIO, VA.

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**GOD'S ETERNAL CERTAINTY IS NOT MAN'S
HELPLESS NECESSITY; OR THE OB-
JECTION THAT GOD'S FOREKNOW-
ING AN ACT RENDERS IT UNA-
VOIDABLE, PROVED FALSE.**

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BY REV. T. WILLISTON, M. A.

OBJECTION II. If God was absolutely certain, when creating Judas, or any other being, that misery would be his eternal destiny, it was “the boldest mockery for Him” to require Judas (or any other creature of His) “to obey and worship Him, or to seek his favor.” The objection amounts to this: God could not possibly be sincere in offering salvation to one that He *knew would refuse it and be lost*; and for Him to demand the love and obedience of such a doomed man would be “mockery”—would be equivalent to God’s telling the man that he might be saved, when He well knew that he could not. Two things are taken for granted in this objection that are false, and its false assumptions render the objection itself utterly untenable. It assumes (1) that *he* could by no possibility love, obey, and be saved, that God foresaw would not be saved; and (2) that a sinner’s obligation to love and obey God is *conditional*—that it is based, *not* on God’s adorable character, *not* on His inflexible rectitude and infinite goodness, but on God’s not knowing, in advance, whether the sinner will be saved or lost. The first of these false assumptions I have in the preceding pages so fully disproved, that I shall add but a word or two more on that point. I have there admitted that if the certainty of Judas’ ruin rendered it in all respects impossible for him to be saved, then he was blameless for betraying Jesus, and God was unjust for making him miserable. But I trust my readers are convinced that Judas’ freedom and ability to love, obey, and be saved, were not a whit the less because it was certain he would perish. And since Judas could have been saved had he but chosen to obey God, it was no “mockery” for God to demand his obedience, or invite him to believe and be saved. But, in the second place, Judas’ obligation to love God was not lessened in the least by his not choosing to love Him, or by its being certain that he never would love Him. The objection takes it for granted that unless a sinner is *sure of salvation*, or unless the question is left *wholly* to his own decision, he is under no obligation to love his Maker. But is this true? Has any sinner a right to withhold from God the love that is His due, until he is sure that God designs to make him eternally happy? Has Judas, or any other ruined soul, a right to hate God because he is not saved? If, as is certain, God’s character will forever be unalterably good, will not the very prisoners of despair be as really bound to adore that character as though they were the prisoners of hope? If not, then it follows that Satan was right when he insinuated that Job’s piety was purely selfish,

and then it is true that my own future happiness is the chief if not the only reason why it is my duty to love and obey God.

To render the fallacy of this second objection still more obvious, let me ask you to ponder the following supposition: Here is a father whose character is in all respects excellent and worthy of admiration, and whom all his children reverence and obey save one. The father is as truly anxious to promote the good of that one as the good of the rest, and the only reason why that one is not just as filial and dutiful as the rest, is his own inherent, excuseless, and persistent obduracy and unloveliness. Suppose now that the father was endowed with such foresight and penetration into the future, as to be absolutely certain that this undutiful and unlovely son would never reform, but would retain his odious character to the end, and be lost. Would the foreseen certainty of that son’s ruin render the father any less worthy of that son’s love? Or would that father be *any less sincere* in offering to reward the rebellious son, if obedient, because he foresaw that his infatuated son would never become obedient? God, then, in inviting sinners to accept of pardoning mercy through Christ, is not insincere, though He knows, and has eternally known, that multitudes of the invited will not be saved. And it is awfully irreverent, as well as grossly untrue, to affirm that “it is the boldest mockery for God to ask” any one “to obey and worship Him,” if from eternity He knew that that person would refuse and be miserable.

OBJECTION III. “It would be monstrously cruel, an outrage that never could be justified or excused, for God to create a soul, knowing with absolute certainty, when giving it existence, that endless misery would be its final destiny.” For Him to do this would be “equivalent to His creating that soul *for* that destiny of endless misery,” and “such an act would be worthy of the devil: but the God of the Bible never did so monstrous an act.” Now this objection has a very formidable look, and uses very bold language, but, like the two preceding ones, it is fallacious, and its fallacy can easily be demonstrated. The author of the foregoing quotation assumes that for God to create any one, *foreknowing* the wickedness and ruin of that person, would be the same as creating him expressly “*for* that destiny” of ruin, or “endless misery.” His language *implies* (not asserts) that God could, in that case, have no motive for creating but the “endless misery” of the person created; and this would of course evince that God is a merciless Being, who creates some souls *on purpose* to have them miserable. But this is taking for granted what is wholly untrue. It is deriving from an established fact an inference that is by no means a necessary or legitimate one. God “delighteth in mercy,” and not in misery; and though He did eternally foresee that many of His creatures would be endlessly miserable, their misery was not the object He aimed at in creating them. I am as free to admit as these objectors are, that *if* God has created even one soul *for the very purpose* of damning him, or if, to accomplish His designs, He has compelled even one of His creatures to bring ruin on himself, and has given that creature no chance to be holy and happy, it was unjust and unmerciful in Him to usher such a creature into being. But there is not the least room for any such *if*. God has endowed every one of His creatures with a conscience and the power of choosing. He has given them all, not excepting Satan and Judas, a chance to be eternally holy and happy; and the fact that multitudes have per-

verted their powers and privileges and brought ruin on themselves, is chargeable proximately to their own wicked choice, and not to God. He, it is true, has had the highest ultimate good of the moral world in view in suffering sin and its necessary concomitant to prevail, but that fact, so far from proving that it was "cruel" and an inexcusable "outrage" for Him to create any freeagents, proves directly the reverse. All lost souls will have themselves, and not God, to ascribe their misery to; and the wrath of both devils and men will be made to issue in the highest good. Paul gave thanks in view of the fact that he was "unto God's sweet savor of Christ, in them that are saved, and in them that perish." And if God will be glorified even "in them that perish"—and "perish because they received not the love of the truth, that they might be saved"—shall we venture to arraign the All Wise One at our bar, and accuse Him of "monstrous cruelty," because He from eternity knew that many would perish? I, for one, dare not thus venture. Neither the Bible, nor reason, nor logic, nor common sense, will suffer me to be thus irreverent.

OBJECTION IV. Closely allied to Objection II. is this one. "To affirm that God requires me to act as though an infallible certainty were an actual uncertainty, is simply blasphemous toward God, and paralyzing toward all my moral energies." Says the same author, "How in good faith, or in fatherly candor, or in common honesty, can God inspire me with a hope of immortal life, . . . when he knows, at the very moment He does so, that my eternal death is an infallible certainty?" In fewer words,—God can with no propriety, or even with "common honesty," require me to love Him, or "inspire me with a hope" of salvation, if it is infallibly certain to Him that I shall not love Him, and not be saved. This objection, like its sophistical predecessors, assumes—what is utterly untrue, and the fallacy of which I think I have made apparent—that if God is certain that I shall perish, there is no possibility whatever of my being saved. I hope I have no reader who is so poor a reasoner that he does not at once detect the fallacy of this assumption. The objection assumes, moreover, that unless God leaves the question of my salvation *undecided*, or unless *He leaves it wholly to me* to settle that question, all encouragement for striving to be saved is taken away, and "my moral energies are paralyzed." Here, again, is an assumption which neither facts nor reason warrant. A wealthy gentleman offers a large premium for the best essay on some topic that he names, and prescribing certain conditions with which all competitors must comply. The premium offered is so large, and the prescribed conditions are so apparently easy, that a large number become competitors, and strain every nerve to win that prize. Does it "paralyze the energies" of any one of these competitors, or slacken his efforts at all, to realize, while striving, that he may not win? Does any one of them all drop his pen despondingly, muttering to himself, "Of what use is all this labor of mine, since it is so uncertain whether the prize will be mine?" And how is it with the offerer of this premium? Is he guilty of "trifling" with any of the numerous competitors, or is he lacking "in common honesty," because, forsooth, he knew, when offering the prize, that all the competitors but one (and possible even all) would fail? Is it *his* fault, or is *he* to be blamed because those competitors are not all successful? And does it prove him a deceiver, because he was certain at the start, that they would not be? Now God offers men a prize

of infinite value, and He not only invites all men to strive for this prize, but if His conditions were complied with by all, all would become winners, all would be saved. That all are not saved, is not ascribable to any want of "good faith, or fatherly candor, or common honesty" in the great Offerer of the prize, but to the fact that they dislike Him and His conditions, and virtually say, "Depart from us, for we desire not the knowledge of Thy ways." And God's foreseeing that many sinners will not repent, or believe, or love, or obey, affords not the least excuse for their refusing to perform these duties, nor has it a discouraging effect on any that are sincere seekers of God's favor. He that really desires to reach a holy heaven, so far from relaxing or abandoning all effort because he is not absolutely certain of success, will, if possible, strive all the more vigorously by reason of that partial uncertainty. What if God were to *assure* every one that indulges any hope, that his salvation was absolutely certain: would that foretold certainty tend to render him a more earnest, watchful, and untiring seeker of salvation, or would its tendency be to generate lethargy, neglect, and spiritual slumber? I maintain that its being, at times, somewhat uncertain to the genuine saint whether he will reach heaven, so far from "paralyzing all his moral energies," is the very thing he needs to arouse and quicken them. Hence I regard it as wise and benevolent in God, that while He knows with certainty what the endless destiny of each free agent will be, He makes it each one's duty to seek his favor with untiring assiduity, without waiting to feel absolutely sure that his name will be found "in the Lamb's book of life." It was not best that every one, or even every saint, should *certainly* know, in advance, that his name is in that book; yet each one may be *sure that it is*, if he has Bible evidence that, having been born of the spirit, "he is a new creature." Away with the sophism that it is "blasphemous towards God, to affirm that He requires me to act as though an infallible certainty were an actual uncertainty."

THE SURRENDER.

BY ELDER W. B. F. TREAT.

False statements as to what infidel scientists believe and teach to be true, are frequently made, and become the means of deceiving the young and the inexperienced. For instance, it is popularly believed that evolutionists claim to have demonstrated that the descent of the human race is from some member of the family of *anthropoides*, or man-like apes, while, in fact, they only suggest and insinuate that, eventually, this claim may be established. And the unnecessary haste of a few sensationalists to warm the supposition into life by coddling it in the pulpit, arouses the suspicion that, with them at least, the wish is father to the thought. Why should preachers admit more than infidels claim?

The general theory of infidel scientists is well stated in the following language by *Haeckle*, the boldest of the lot. Speaking representatively, he says their claim is this: "All species of animals, all species of plants, which have ever existed, or yet exist on the earth, are derived from one single, or from a few simple, original forms, and that they have developed themselves from these in the natural

course of a gradual change." *Hist. Crea., Vol. I., p. 4.*

So much for the claim. Now for the specific findings, the evidence and the demonstrations under that claim. The same expositor of Darwinism, says: "I must here point out what in fact is self-evident, that not one of all the still living apes, and consequently not one of the so-called man-like apes, can be the progenitor of the human race. This opinion, in fact, has never been maintained by the thoughtful adherents of descent, but it has been attributed to them by their thoughtless opponents. The ape-like progenitors of the human race are long since extinct. We may possibly still find their fossil bones in the tertiary rocks of Southern Asia or Africa. In any case they will, in the zoölogical system, have to be classed in the group of tailless, narrow-nosed apes. (*Catarrhini Lipocerci, or Anthropoides.*)" *Hist. Crea., Vol. II., p. 27.*

Here all pretence to a scientific knowledge of the origin of man is abandoned. This great light on the hills of science, though writing only to establish evolution, flashes back the admission that the structural differences between man and all the known forms of the ape family are so great that he could not possibly have descended from them. And he further states that no "thoughtful" evolutionist ever claimed that the progenitors of the human race had been discovered. In fact, he assures us that in all known fossil remains there is not a tooth, a track, a hair, or a toe nail of any animal from which man could have been derived. Thus fades from the claims of scientific knowledge all pretensions to identify man with any existing or preceding form of life. No effort is made to bridge the impassable gulf. But standing here at the abrupt termination of all positive knowledge concerning man, just where the Bible says his history began, our scientific leader looks out into the deepening gloom of chaos, and sullenly says, in the interests of unbelief, "There must have been such an animal, and if he is ever found he will have a sharp nose and a short tail!"

And yet, on the strength of such bosh as this, some men are ready to ignore the Bible statement that man emanated from the breath of God, and to degrade themselves by the pruling sentiment, "I had as lief be descended from the loins of an ape as from a lump of clay." (Either source would seem to be sufficiently exalted for a man capable of using the expression.)

I close by propounding this query to any materialistic infidel or agnostic: If we have no knowledge of God, and are the children of the ape, why are we better than they? Without God, and with only an animal evolution for your origin, why do you assume to look in apish horror on the foibles and sins of some preachers and professors of religion? Having repudiated the image of God in man, as well as the authority of Christ, do tell me by what standard of morals the race is responsible? To put it so you cannot dodge the question, let me ask: Upon your hypothesis, that man is the lineal descendant of an ape, why is he capable of a flagrant sin against the moral law, while the monkey is not? Your brethren

out West have failed to answer this question. Can you do it?

BLOOMINGTON, Ind.

IS CHRISTIANITY ANTI-SCIENTIFIC?

BY PROF. I. L. KEPHART, A. M.

The affirmative of this question is maintained by some of the noted modern scientists of today—in fact, by all who are of the materialistic school. They base their accusation upon the fact that Christianity, fundamentally, teaches the doctrine of miracles and the reality of the supernatural. They claim that all the various formations and transformations that have taken place in the material world, that all the diversified forms and varieties of vegetable and animal life now existing, have been evolved from matter by the operation of an all-pervading law, one of the chief characteristics of which is "survival of the fittest." But what is this law? Is it a personality? Does it execute itself? Does law, of itself, do anything? Are not law and the force that executes law necessarily separate and distinct? Blackstone says, "Law, in its most general and comprehensive sense, signifies a rule of action." According to this definition, the "all-pervading law" of the evolutionist is only "a rule of action," in accordance with which the visible creation has been produced. Is Christianity anti-scientific, then, because it recognizes the existence of the Author and executor of Nature's laws? Its recognition of the existence of such an Author as an actual personality, as the Creator of matter, as the energizing agent who stamped upon matter all its laws, and even now executes those laws, is only a virtual recognition of the fact that matter and mind are distinct existences—a fact which even bald materialism is now compelled to admit.

The time was, and not very remotely, when materialists claimed that mind and mental operations were only certain results of molecular combinations of matter. In fact, many materialists still struggle to uphold this false assumption; but with the onward sweep of investigation it has been so completely sloughed under, its absurdity has been so completely exposed, that they no longer dare openly to advocate the assumption. The intelligent thinkers of the world are rapidly coming to recognize the distinction between the moving body and the *force* which moves it. They are beginning, with Dr. Wilford Hall, to recognize the common-sense fact that the *force* which *moves* matter must be a SUBSTANTIAL ENTITY, superior to and independent of the matter moved, and that all *force* has its origin in *mind*. And as there are inferior *forces* and inferior *minds*, so there must be a Superior Force and a Superior Mind; for the existence of the inferior implies, according to the *scientific method*, the existence of the Superior.

But Christianity recognizes the existence of inferior *minds*, and it teaches the existence of the Superior Mind. It recognizes the dependence of the inferior, and it teaches the independence of the Superior. It teaches the accountability of the finite and the rightful authority of the Infinite. It teaches the supe-

riority of mind over matter, as do the most advanced scientific investigators of to-day. Is it therefore anti-scientific?

True, Christianity teaches the existence of a Supernatural Force—that is, a Force, a Personality superior to matter; but scientists have been driven to a necessary recognition of the existence of mind, and of the fact that mind is a personality—a *substantial entity*, superior to matter. And the fact that Christianity recognized and taught the existence of mind as superior to and of far more importance than matter long before scientists recognized its existence, certainly indicates that Christianity is, and has been from the first, more truly scientific on this point than modern scientists have been.

Christianity teaches that miracles have been performed, and its adherents firmly believe they have been; and it may be true, as Goldwin Smith seems to think, that the belief in miracles has *practically* interfered with the formation of the scientific habit of mind, and thus retarded the progress of Science. It may be true that a belief in miracles has fostered superstition. But, admitting such has been its effect, I would still ask, Where do we find men the most superstitious? What nations and peoples and tribes are most degraded in this respect? How do the inhabitants of Christianized Europe and America compare, in this particular, with the inhabitants of Asia and Africa? Who are the most superstitious, the followers of Jesus or the followers of Confucius and Budha? It should be remembered that Christianity found man overwhelmed in superstitious bondage, and one of the greatest obstacles it has had to overcome, and, even now, encounters among the pagan races, is their terrible bondage to superstition. Christianity recognizes the existence of a Supernatural Power, without the existence of which even science cannot account for the ongoings of the activities of the universe. Why, then, should Christianity be considered unscientific because it teaches that this Intelligent, Supernatural Author and executor of the laws of Nature has at certain times suspended those laws for the accomplishment of certain beneficent purposes?

Christianity is accused of being anti-scientific because it teaches and requires "the exercise of a blind faith." But is that faith which believes in the Author of life and of the laws of Nature as the Giver of our daily bread any more blind than the faith that believes that the prong of a tuning fork, when moving at the rate of only an inch in an hour, sends off air waves which move at the rate of 1,142 feet in a second? or is it any more blind than that scientific (?) faith that believes that there exists throughout all space, and for the sole accommodation of the undulatory theory of light, "an invisible ether," and although no one has ever been able to taste, smell, feel or hear this ether, yet "it is a real jelly-like substance, partaking more of the nature of a solid than of a liquid or fluid?" Before materialists scoff at "the blind faith" of Christianity, they had better think for a moment of the amount of "blind faith" some of their so-called scientific theories require of all who subscribe to them.

As to the charge that Christianity has retarded and hedged up the way of physical investigation, every close thinker and careful observer knows the charge is false. What countries have produced the greatest thinkers, and of what faith have they been? Were not Sir Isaac Newton, Michael Faraday and Louis Agassiz devout Christians? Was it not Dr. Franklin who proposed prayer in the Constitutional Convention, and thus most impressively declared his belief in the duty of prayer as enjoined by Christianity? Not until Christianity, by proclaiming and inculcating Peace on earth and good will to men, and impressively teaching the superiority of the mind over the body, had paved the way for scientific investigation, did scientists begin to appear; and it is by the aid of the schools and the spirit of candid investigation, *fostered by Christianity*, that the opportunities, qualifications and facilities for thorough scientific investigation have been brought within the reach of those who have become eminent in the field of candid, thorough investigation.

WOODBIDGE, Cal.

THE EARTH'S ANNULAR SYSTEM.—THE TRUE ORIGIN OF COAL.

BY PROF. ISAAC N. VAIL.

Whence comes the carbon supplied to the vegetation of this age? It rises as smoke, etc., from the fire-places and furnaces of the earth. If such sources of carbon were cut off, vegetation would decline and finally cease to cover the earth. To-day, when smoke or unconsumed carbon, rising from the seat of combustion, comes in contact with the free oxygen of the air, as well as with the aqueous vapor or moisture in the same, it is converted into two compounds, viz.: carbonic anhydride, a plant-forming compound, and a bituminous oxyhydro-carbon, a *non-plant-forming* compound.

This latter, however, when confined in a vessel with water, will decompose the latter, and *give rise still further to plant-food*. This any chemist can prove. The bituminous product may be seen on the interior of every chimney and on the back wall of every fire-place where smoke-producing fuel is burnt. This oily substance frequently takes fire and burns again, proving that smoke or unconsumed carbon, under inexorable law, becomes a *combustible fuel*, after it has once passed from the furnace. Disastrous fires have occurred from the spontaneous combustion of collections of soot. I refer to these simple processes, because they are familiar to most people.

Now, this being the process of to-day and the result of law, it *must have been the same in all ages of the earth!* Let us keep this in view. If from every furnace fire and volcano on earth arises unconsumed carbon, and, associating with aqueous vapors, becomes carbonic acid, hydrocarbons, and oxy-hydrocarbons, *that carbon must have done the same thing when it was originally driven from the molten earth*, and became a combustible fuel after it left the furnace. Every philosopher must know that if this earth ever

was in an igneous condition, it sent up from its inmost depths vast and measureless quantities of smoke, or unconsumed carbon, that mingled with the primeval aqueous vapors on high. In short, it must have had its place in the earth's annular system as a vast fund of *bituminous oxy-hydrocarbon*, WHICH IS COAL! Now, the annular theory maintains that every world, once incandescent like the primitive earth, must, from the very nature of the constituent elements comprising the universe, during some period of its career have been enveloped with this carbonaceous matter. Can any man at all familiar with the terrestrial elements—at all familiar with the evidence that the earth was at one time a burning and therefore a *smoking* world—shut his eyes upon this conclusion? Can he look upon the dark belts of Jupiter and Saturn, and make a philosophic claim that they are composed of any other matter than unconsumed carbon—the future coal veins of the Jovian and Saturnian carboniferous ages? He may ransack the whole chemical laboratory of Nature and find nothing else to fill its place.

But what has become of the carbon that went up during the earth's igneous era? It must have fallen back to the earth away down in the ages. Now, if it fell, it is evident that it must have observed the following legitimate conditions:

1st. It must have fallen, like all the other matter of the annular system, in greater abundance in the higher latitudes.

2d. In the course of its transportation through the oceanic waters it would be assorted—the lighter carbonaceous matter would be carried nearer the equator, and the heavier would be deposited first. That is, in the Northern Hemisphere, for instance, the carbon having the *greatest specific gravity* would be among the northern beds.

3d. The mingling of this form of carbon with the waters of the earth must have produced *plant-forming compounds* (just as we see to-day), and therefore a luxuriant vegetation must have been impelled by their very presence; and in all favorable locations this vegetation must be found fossilized in the bituminous beds.

4th. It must be found to be essentially and largely a sedimentary deposit, associated with oceanic formations in all continents.

5th. When found adjacent or approximately near a lime formation, either above or below, there will be in these carbon beds few or no *terrestrial* plant fossils, such as ferns, etc., because it must there be a deep-sea formation. The remains of vegetation here found must be marine, while carbon beds found with an abundance of *terrestrial* plants will be associated with shore deposits, or swamp formations.

6th. As all calcareous waters necessitate the presence of organisms adapted thereto, and impel of the same calcareous petrefactions; as silicious waters demand their own appropriate organisms and form of them silicious petrefactions, so the carbonaceous waters, under law, must have had their own organisms, and these were various forms of vegetation, mineralized in their *own element*. In

other words, vegetation could not by any possibility have become a *carbonaceous mineralized fossil* except in *carbonaceous waters*.

These six conditions are but a few of the vital tests, any one of which, if turned against the annular theory, would crush it. Let us briefly examine a few of these:

As to the first, all geologists well know that there is an abundance of *bituminous oxy-hydro carbon* under the very arctic circle, and that on both continents the coal veins are vastly thicker, as a general thing, north of 50 deg. lat. N. In Nova Scotia is one vein averaging thirty-eight feet in thickness, another fifteen, and still another twelve feet. The aggregate thickness of the British coal veins is much greater. In Wales alone there are more than one hundred veins. Now, why is this? If coal is the product of a vegetation, why was that vegetation so much more luxuriant toward the poles?

But the consideration of the second will be short and decisive. The coals of these northern lands possess a much greater *specific gravity* than those nearer the equator (comparing anthracite with anthracite and bituminous with bituminous), a condition demanded by the annular theory, but otherwise inexplicable.

As to the third, all men of science know there is an abundance of fossil vegetation in the coal. Then there must have been an abundance of *carbonaceous food* to make it. Since we know that to-day carbon makes vegetation, why reverse it in the carboniferous age and say vegetation made carbon? when every man of reason ought to know that if all the plants and trees of that age had been associated with silicious or calcareous matter instead of carbonaceous, *they would not have been carbon mineralized fossils*. The man that plants his feet on *this rock* cannot be moved.

It would require many pages to show the truth of the fourth, fifth and sixth propositions. Allow me to say that they are literally true! If one should find a boulder in a coal vein, as I have again and again, some of which must have been carried hundreds of miles in water, if he should see a coal vein embraced by two extensive lime deposits, he would naturally conclude that it was *found in the ocean*.

There are some features more positive than any I have yet shown, but I must reserve them for the day of battle. From this reserve force, however, I will draw one for this article.

When the smoke was driven up from the molten earth there was of necessity formed *several forms* of carbon. The lighter forms of necessity arose farther than the heavier. The latter, located nearer the earth, must have fallen earlier, and become associated with the minerals and metals that characterize the oldest sedimentary rocks. How could it be otherwise? The formation of these heavy forms of carbon can only take place in sublimation or distillation of matter containing carbon, as any chemist knows; and he knows, too, that in such distillation there must be *heavy* forms of carbon separated from the lighter, and if law is law, the lighter forms and heavier forms could not fall together and mingle in the same rock formation.

Now, are there such heavy forms of carbon to be found in these older rocks? It is well known to *all* geologists that there are prodigious quantities of the same in the Laurentian piles. Dr. Dawson, than whom there is no higher authority on this subject, asserts that there is a greater amount of carbon associated with those heavy metaliferous rocks than in any subsequently formed beds. Enormous masses of graphite-carbon, nearly pure, and formed only by the action of heat, have their original home in the very rocks that philosophy and the annular theory demand.

But the most positive, and I must claim absolute, *proof*, is contained in the well-known fact that *not a particle of fossil vegetation has ever been found in or near these old beds of carbon!* Geologists say "Carbon is a product of vegetation." Coal is carbon: therefore coal is a vegetable product. Graphite is carbon: therefore graphite is a vegetable product. Now, it is impossible that during millions of years, perhaps, while the Laurentian beds were forming, if there was *any* vegetation, to say nothing of the vast amount of vegetation required to form graphite beds, that there should not have remained some trace of a *leaf* or *stem* to prove it. Then, since this form of carbon was *not* the product of vegetation, what is the geologic syllogism worth? Why not admit the demand of inexorable law, that if the earth originally contained *any* carbon, and was in a molten state the formation of heavy carbon and light carbon *was* a necessity. There is the earth's heavy carbon, stored away in the Archean rocks, and here is its light carbon stored away in the very rocks its specific gravity requires, and the annular theory is ready to prove it. Oh, the ineffable wisdom of the Most High! in thus taking the carbon and the very metals needful to man from the inaccessible depths of the earth and putting them in store-houses just within his reach! If it were not for that igneous era, no coal could have been found, and the metals and minerals sublimed in that inmost ocean of fire, could never have been reached by the puny hand of man.

This paper closes, for the present at least, my articles on this subject. The reader must not imagine, however, that the subject is exhausted. Let me say to those who have patiently followed me in my argument, that I desire that they now review it and give it their best thought. This age is just ripening for this harvest. Though the theory is entirely *original* with me from beginning to end, not even a suggestion, now incorporated in it, having reached me from any one; *yet it is not my discovery. It is the discovery of the age!* Who will say there are not ten thousand men who never heard of me, that are thinking *with me to-day* on this grandest subject that can engage the man of science? To the great family of the Microcosm, and to its kind Editor in particular, I tender my heartfelt thanks. For years the annular theory applied in vain to the leaders of scientific journals for some little recognition. Imagine, then, my feelings of obligation toward the annihilator of the "Wave Theory of Sound."

BARNESVILLE, Belmont Co., Ohio.

THE LAWS OF MIND.—No. 9.

BY REV. J. W. ROBERTS.

Before entering upon an exposition of the laws of mind proper, it is expedient to define the properties of mind in themselves, as upon the essential and fundamental qualities of the substance or essence of an entity must depend the laws by which it is governed. As any arrangement of the order in which these are presented is necessarily artificial and more or less arbitrary, it matters little what the order shall be. The following has seemed to the writer as good as any:

I. *Mind is immaterial.* This quality of mind has already been presented in the argument to establish its immaterial origin. That argument may be elaborated. Thought is the basis of all mental products. It precedes words and acts. It builds houses, roads, aqueducts, all manner of structures in its own domain, before they take on material forms or become actual realities in the visible world. No word is spoken, no act performed by man until the same has first been conceived in thought. As to all mental manifestations, therefore, thought is the primordial effect of the mind, from which all that it does proceeds. And thought is immaterial. If this is not admitted as a self-evident proposition, it may be demonstrated from the fact that none of the five physical senses of man can recognize, capture or take hold of it. It is intangible to them all, single or combined. It may be put into words, spoken, written or printed; or into painting or sculpture; or into melody and be sung; into expressions of face, eye or form; or into all mechanical devices of whatever description, simple or complex, and in these materialized forms the thought of one intelligent being may be communicated to another. But these artificial and mechanical devices which are employed to convey thought are no more the thought itself than the vehicle which carries him is the man who rides in it, or the casket which holds it is the jewel it contains. These appliances and modes of communicating thought, however, are happily adapted to the condition and wants of mankind, as without them there could be no community of interest, no mutual protection, no development in society, no progress on the part of the human race, as the aggregate of human units. How much each unit could progress within itself, if deprived of all other help, is a question of doubt and debate, the discussion of which must always be barren of practical results, good or bad, as no such state of unification exists.

That thought is immaterial is proved by the further consideration that it is subject to no laws which govern material things. True, its environments and modes of communication are material, and subject to the laws which dominate matter, yet itself maintains and retains entire freedom from these restraints. Its outgoing is more rapid than the flight of light, the motion of electricity, or the movement of any other substance of which we have any knowledge, and there is no limit to its outreach. Its empire is boundless as space, limit-

less as infinitude, and nothing impedes it in the occupancy of its measureless realm. It goes from the heights of heaven to the depths of hades, from pole to pole, and star to star with equal facility and unmolested by anything in the material universe.

If the product of the mind is immaterial, as thus clearly shown, then the mind itself must be immaterial, for like produces like, and that which is material cannot produce its opposite, that which has no materiality.

The facts and arguments heretofore presented in this and preceding papers demonstrate, concusively and irresistibly, that mind is immaterial both in its origin and essence—a truth that ought to be conceded without proof, being practically self-evident, but which sophistry has tried to overthrow.

II. *Mind is indestructible.* This proposition may be established from various considerations and admitted facts.

1st. Nothing is lost or destroyed in the sense of annihilation. Matter and substance are both indestructible. So are their products. This is a wonderful discovery of modern science. Even that which was formerly thought and taught to be wasted or lost power, is now determined to be a great conservating element in the correlation of forces, and is only transformed, not lost.

Mind can be no exception to this universal and all-comprehending law, for mind is the highest form of development of which we have any knowledge in the scope of philosophical or scientific investigation, and if all the lower forms are indestructible, the highest must be also. This conclusion is inevitable, being not only sanctioned but impelled by both reason and science. Here the case might rest; but to make the position taken still more impregnable, it may be added,

2d. That thought, the product of mind, is indestructible; and as the creature cannot be greater than the creator, or an effect greater than its cause, mind, which originates thought, must of necessity be indestructible. But as the premise may be called in question, not being apparently axiomatic, it becomes necessary to prove its correctness, that the conclusion deduced may abide. A position that can be made a Gibraltar should not be left open to successful assault.

That thought is indestructible may be established from the fact that the thoughts of Homer, Socrates, Plato, Aristotle, Cicero and the ancient worthies of profane history; and of Moses, David, Solomon, the prophets, Christ and his apostles of sacred history, are still alive, and not only alive, but are active forces in the realm of mind in the last quarter of this nineteenth century, though they are thousands of years old in some instances, and nearly two thousand in those of least age. Indeed, the thoughts of these ancient teachers are exercising more influence in the world to-day among men than they ever did at any previous period since they were first given to man. They have been influencing the generations of mankind from the time they were added to the mental capital of the race to the present date; and, as will readily be admitted, are more potential now than in any age of the past. What is true of

the thoughts of these persons is true of all thoughts; for though the vast predominance of the bulk of thought may *seem* to perish, yet, like the lost power in mechanics, this is only in the seeming; for thought in itself is indestructible. If thought, then mind, and, if possible, the latter in a more eminent degree, being the source, fountain, or origin of thought.

3d. *Thought is substance.* This is shown from the fact that *mind feeds upon thought.* The thought of the great minds of antiquity, some of whom have been mentioned, have been furnishing *mental force for the intellect of man during the past ages.* Mind cannot feed upon *nothing*; hence *thought is substance*; and, as already demonstrated, *indestructible substance.* It is by virtue of these properties, or this combined property, that the thoughts of men who have been dead these hundreds and thousands of years are still doing duty with undiminished vitality, and by reason of added facilities for their propagation, with ever widening scope of activity. This is not only a proof of the proposition under discussion of the most conclusive nature, but is also a most wonderfully suggestive truth.

The thoughts of parents are reproduced in their children; of teachers in their pupils; of rulers in the ruled. The thoughts of our age become the property of the next, and so on down through the unbroken series of the generations of men, proving both their indestructibility and substantialism—ever alive, ever imparting nourishment.

Memory furnishes another proof of the indestructible and substantial nature of thought; for it ever continues to recall and reproduce the thoughts of former years; not only those which originate in the mind of which it forms a component part, but also those communicated to that mind from other minds, of which it takes notice. Thoughts and events, which appear to have been forgotten, under proper circumstances are recalled in all their original freshness and vividness. Extraordinary instances of this kind are on record, and every person of any considerable age can recall examples in his or her experience. The recollections of youth are often the brightest mental possessions of age. These, with other facts that might be presented did time and space permit, establish the undying and substantial properties of thought, and that it must originate from a source adequate to impart these qualities, which are intrinsic and communicative.

III. *Mind possesses life.* In its lowest phases, life is found in the vegetable kingdom; but its presence in mind is of a much higher order of development. This proposition being unquestioned, need not be elaborated.

IV. *Mind is intelligent.* This property, like the other named, is inherent, and mind cannot exist without it. The degree of intelligence in the lowest orders of animate creation is very small indeed, being restricted, apparently, to the powers of motion and ability to imbibe food. From this almost imperceptible beginning it reaches upward in an ever-widening series of gradations, until it nears the bor-

ders of reason, but does not enter its domain. In all the lower animals and animates the modicum of intelligence possessed is termed *instinct*. Instinctive intelligence is transmitted from parent to offspring in all its fullness, and remains fixed within its original limits. Hence, there is no progression on the part of these orders of creation, and they are no wiser now than they were six thousand years ago, or in the "beginning." In a few instances, by training, those beasts and birds which possess memory and the powers of imitation, a very low degree of man's intelligence may be imparted. The law governing these cases it is designed to examine hereafter. If these lower orders of the animal kingdom possess the ability to think at all, it is in a very low degree of development, corresponding with their mental endowments, and not at all comparable to this quality in man. It is debated whether instinctive knowledge requires the aid of thought. It is probably most reasonable to assign to it a measure of the capacity to think commensurate with its measure of intelligence and action. As the purpose of these papers does not comprehend the discussion of mind as it pertains to these lower orders, except incidentally, this point is dismissed. The marked distinction between man and inferior animals is this: that while their range of intelligence is limited by laws as unbending as fate, there is no limit placed upon his ability to acquire knowledge and add to the store of his intelligence; and that while the beast may transmit its intelligence to offspring, he cannot transmit his.

V. *Mind is spirit*. Immateriality and indestructibility do not constitute spirit, though they are sometimes inadvertently or mistakenly used interchangeably, and the terms employed to convey that idea. A thing may be both immaterial, as gravity, or indestructible, as is every thing of which we have knowledge, and yet not be spirit. Of course these properties are essential to spirit. *What is spirit?* The question is easily asked, but, like myriads of others, must remain unanswered until further light dawns upon the mind. Let us again take up thought. It has been ascertained to be immaterial, indestructible and substantial, but all these qualities fail to confer upon it the *quickening power of reproduction*. Neither of these properties, nor all of them combined, can even give life, much less the energy that quickens life. Life itself may exist without intelligence, as in vegetation. Life, in itself, therefore, cannot even originate thought in any form, much less endow it with *quickening vitality*. Intelligence is not thought, for intelligence uses thought, and thought, in time, uses intelligence. What, then, does infuse this quickening energy or quality into thought? Or, if you please, what is the life-power and life-producing power of thought? *It is spirit*. No other entity in nature has this property; therefore no other can communicate it. These facts—they can scarcely be classed as anything else—prove these things, namely, that *there is spirit*, that *mind is spirit*, and that *thought receives its quickening vitality from spirit*.

We now have *immateriality, indestructibility, life, intelligence and spirit* as the constituent elements of mind. These may be

called its natural or inalienable attributes. This is a somewhat radical departure from the method usually followed by mental philosophers, but is believed to be in accordance with the facts, and the most logical and analytical mode of treating the subject. These properties of mind are essential and beyond its control, and, except in the single case of intelligence, beyond the reach of modification by it. All the other properties of mind are subject to control by it, while no power in nature can affect these in their intrinsic essence, except in the one instance named.

On this fundamental and immovable basis we may now proceed to classify the controllable attributes of mind. In so limited a space, however, it is impossible to do more than generalize this classification into groups, leaving the reader to fill up the analytical omissions or gaps.

First. The Propensities, which man possesses in common with lower animals. These embrace the Appetites, Passions and Affections.

Second. The Intellect, which embraces *Perception, Reason, Judgement, Imagination*. These may or may not be further analyzed in these papers, but will come partially under review.

Third. Moral Attributes. These are the crowning glory of man and lift him into more intimate kinship with God. The intellectual faculties elevate him far above all other orders of created things on this planet; but to know right from wrong, with the ability to do the right and reject the wrong, makes him that far a "partaker of the divine nature." With these lofty endowments are coupled corresponding responsibilities and obligations. *Man becomes a subject of law*. At present these attributes can be little more than named, and are presented in this order:

1. *Self-Consciousness*. The first thing any rational being can know is that *I am*. This is the starting point of all action.

2. *Volition*, which confers the power and duty of making choice, in all cases when alternatives are presented.

3. *Will*, which executes the decisions rendered by volition. Will is the autocrat of the mind, the court of final hearing, from whose decisions there is no appeal.

Let us recapitulate: *Perception* presents material for consideration. *Reason* examines, investigates, analyzes. *Judgment* weighs and determines values. *Volition* makes choice between claims presented and renders his verdict. *Will* executes the decision of the court. These constitute

4. *Self-Government* in the realm of mind.

Imagination furnishes recreation for the mind. It is also the faculty of perception in the purely mental realm, outside the range of sense.

Memory is the historian of the mind, and keeps a faithful record of all its conscious acts and thoughts. It is the servant and the assistant of all the other faculties.

Emotions are effects produced in the mind by internal or external causes.

Conscience is the mentor of the mind. It tells what is right and what is wrong. It is

both witness and judge. It expounds the law, bears witness to the truth, accuses or excuses, approves or condemns; and always prompts and urges to right thoughts and acts, while it admonishes and warns against evil. It has been termed, by reason of its properties and offices, "God's vicegerent in the soul."

Mind is progressive. It is the only thing in the universe, so far as human knowledge extends, that does progress. All else is bound and restricted to original endowments. No finite limits are placed to this property of mind. In no direction is it "shut up with bars and doors." This quality proves it to be essentially different from anything else in nature, and requiring laws peculiar to itself. More of this hereafter.

In the foregoing classification no beaten track has been followed. The aim has been to let the faculties of the mind arrange and classify themselves according to the office they perform in the mental economy.

The effort to condense in this paper may have left some positions less clear and strong than they ought to be made; but as these productions are designed principally for thoughtful readers, they will be able to supply any lack by calling general principles to their aid. A further analysis, at least in some respects, will be made as the investigation proceeds. The next number will be devoted largely to a discussion of the immortality of the mind or soul.

REPLY TO THE CHRISTIAN STANDARD.

BY ELD. THOMAS MUNNELL, A. M.

In reply to certain strictures which appeared in a recent number of the *Standard* upon an article I sent to the *Christian Evangelist*, I now send you the following answer, which presents the views of Dr. Hall, Editor of *THE MICROCOSM*, chiefly in his own words, taken from correspondence with him on the subject, but which I fully indorse.

The writer in the *Standard* evidently has a very imperfect and limited conception of the amount of mechanical force it would require to move and thus overcome the inertia of four cubic miles of air, which the locust in stridulating is compelled to shake into "condensations and rarefactions" according to the accepted theory of sound. 'Tis true, *air* seems to weigh nothing, as the critic says, being in equilibrio, just as water seems to weigh nothing if inclosed in a sack below the surface. So also with quicksilver, under like conditions. Yet the four cubic miles of air, thus condensed and shaken by the insect, actually do weigh in pressure on the earth's surface more than 20,000,000 tons, not "pounds," as it appeared by mistake in the *C. Evangelist*. The *Standard* critic, however, supposes that a pair of locusts could fly away with a sack containing the four cubic miles of air, if the sack were as light as the air! This statement is simply astonishing. A sack only 100 feet in diameter, and containing enough hydrogen gas to balance the weight of the sack, thus making the whole thing weigh *nil*, could not be pulled through the still air by the combined force of a dozen strong men as fast as a little child would walk; while a pair of locusts could not fly away with a like sack *only one foot in diameter* faster than a snail could crawl, owing to the resistance of the air to displacement, *weightless* as it seems to be. Yet by actual esti-

mate there are more than *six hundred thousand* such 100-foot sacks, and more than *five hundred thousand million* such foot-sacks of air contained in the four cubic miles which the *Standard* critic thinks a pair of locusts ought to fly away with!

A very small force, we admit, steadily applied, will move a large body equipoised in air or water, or even in quicksilver, one of the heaviest of substances. A man could move the Great Eastern in still water by pulling at a cord attached, if he pulled steadily and long enough. A mass of water of equal weight inclosed in a sack below the surface could be moved in like manner by the strength of one man. But all this is not the real problem of the locust and the work it has to perform, according to the wave-theory. It is not the displacement of even a considerable mass of air by slow and steady pull, but the *sudden displacement* of the 20,000,000 tons and repeating this displacement from absolute rest to motion, and *vice versa*, 440 times a second. As before observed, a small cord would be strong enough to move the Great Eastern by slow pull, but to move it back and forth 440 times a second never so small a distance would be equal to the strength of a hundred manilla cables. Yet 10,000 *Great Easterns* weigh less than the air the locust has to move! To suddenly overcome the inertia of a mass of suspended matter, and repeat this displacement hundreds of times a second, would be an almost infinitely greater task than displacing it in one direction by steady pull. Yet this very task of thus displacing 20,000,000 tons of ponderable matter has to be performed by a mere insect, if there is any truth in the wave-theory. Is such a feat possible?

The *Standard* critic bases his idea of the insect's ability to move the air, upon the fact that it is *mobile* and *weighs nothing*. Let us now give him something *solid* to try his pair of locusts at. He has not begun to grasp the extent of the difficulty involved in the locust problem as now urged against the wave-theory of sound in *THE MICROCOSM*. The shaking of 20,000,000 tons of suspended air-particles by this insect, and alternately squeezing them into "condensations and rarefactions" 440 times a second, is but a bagatelle compared to what the locust has to do, if the wave-theory be correct. According to that theory we can only hear sound by our tympanic membrane bending "once in and once out as each sound-wave strikes it," as Prof. Tyndall and all authorities on the subject teach. This membrane is constituted of *solid tendinous matter*, each membrane weighing in air half a grain by actual test. Now, as the sound of this insect could be heard, if an ear were present, at every point of air throughout the four cubic miles large enough to contain such a membrane, it demonstrates, if the wave-theory be true, that every such point of air is actually condensed and shaken by the strength of the insect, in addition to its displacement, with a mechanical force sufficient to "bend in and out" a solid membrane weighing half a grain, *whether or not such membrane be present*. Hence, as a cubic quarter inch of air gives sufficient room for such a membrane to vibrate in freely, we fairly estimate each such block of air as the exact equivalent of the mechanical displacing force of *one-half grain of solid matter*, or thirty-two grains to the cubic inch of air. No mathematical reasoner will doubt the fairness and correctness of this estimate, for plainly if we only hear sound by our "drum-skin" shaking, then every point of air filled with the sound, large enough for such a drum-skin to vibrate in, *must be estimated as the exact equivalent of the shaking of such a drum-skin*,

whether present or not. Then by simply multiplying the easily ascertained number of cubic inches in the four cubic miles of air (in round numbers *one thousand million million*), by thirty-two grains of solid matter, we have in round numbers *two thousand million tons* of such drum-skins that the locust has to "bend in and out," overcoming their inertia 440 times a second, or in other words, it has to exert that equivalent of mechanical force if the wave-theory be true. This is *solid* scientific and mathematical truth, and no man can get over it but by denying tympanic vibration as the mode of hearing sound, which is to deny the wave-theory altogether, as that is the very basis of the received doctrine of acoustics. These *two thousand million tons*, remember, are not equipoised air-sacks for locusts to fly away with, but solid membranes weighing the same and requiring the same force to bend them as two thousand million tons of brass membranes equally tensioned would require. Is it possible for a theory to be true which involves such a monstrous impossibility as this?—such an almost infinite task for a trifling insect to perform? Yet that theory, with this absurdity loading it down, is taught in all our schools and colleges as true science.

But we now come to the most important part of the criticism in the *Standard*, which attacks the corpuscular or substantial theory of sound, urged by Dr. Hall as being more consonant with all observed facts than any other conceivable view. The critic seems to misapprehend the very nature of *incorporeal substance*, of which sound-corpuscles consist, as the author of the new theory maintains. If this sound substance be incorporeal, analogous to electric discharges which shoot through a wire at a velocity of thousands of miles in a second, or analogous to rays of magnetism that dart off from the poles of a magnet, pass through sheets of glass, and lift ponderable bars of iron, then that substance does not come under the laws and properties of matter at all, and has no ponderable value. It is not *sent* off by the mechanical strength of the insect as a material substance like the air or water would have to be sent if it moved at all. No material body *stirs*, only as forced to move *mechanically*. All the imponderable substantial forces, however, travel by laws of conduction and radiation given to them by the author of Nature. The battery or dynamo-machine surely does not *send* or *drive* off the electricity through the wire. The perfectly still or motionless magnet does not *send* the magnetic rays through the glass, in any strict scientific sense, to lift a distant bar. The trifling mechanical agitation of the burning taper does not *send* the substantial light-rays away at a velocity of 180,000 miles in a second. No; but these substantial forces all *travel* by laws as ordained of God in the economy of Nature. Hence all the talk about sound-substance weighing either the *same* as air, *more* than air, or *less* than air, in this criticism, is a waste of rhetoric. *Sound weighs nothing at all*, and therefore does not carry the air with it, as the *Standard* critic supposes, any more than *light-substance* carries the glass with it in pouring into our rooms through the windows, both being alike imponderable and immaterial substances. As sound, unlike any material substance, travels by a law of conduction of its own, the locust has therefore only to generate this substance by a vibratory process ordained in Nature, and it at once goes on its errand by the law of God, appointed for that purpose, just as light or electricity goes forth as soon as generated. The undulatory theory of light is already beginning to

be abandoned by the more enlightened and independent scientific thinkers of Europe, since they are coming to realize that the necessary "*ether*," on which that theory depends for its life, has no existence, as yet discovered. Hence light, like electricity and magnetism, must be an incorporeal substance. And if *light*; why not *sound*, since the eye and ear are admitted to be sensuous congeners in the economy of Nature?

But the *Standard* critic seems really to have struck a happy thought, and supposes he has effectually caught the substantial philosopher napping at last. He seems to think he has him as safely secured in the meshes of his logical network as any octopus ever had a helpless porgie with his formidable antennæ wound about it. He has discovered that if sound is an *entity*, according to Substantialism, and if the locust *generates* these substantial pulses by its stridulation, then the insect actually creates *something out of nothing*, by scraping its legs across the nervures of its wings! This is plain, he thinks, because no sound was there till the scraping began. Or, if this substantial entity is not created out of nothing, then it must be manufactured out of the insect's organism, so that the poor little thing ought soon to use itself up in its own substantial noise! And still worse, what becomes of this sound-substance when it ceases to be audible? Is it annihilated? etc., etc. I have made the case even stronger than did the critic, to give the Substantial Philosophy a rare opportunity to show its powers of solution and explanation. And here its founder comes to the task, by the remark: "How easy it is for even great men to be mistaken, especially when attempting to criticise something they do not understand or have not thoroughly investigated!" a very sensible remark, by the way. He then proceeds substantially thus:—According to Substantialism, the incorporeal *force-element* in Nature, from which sensuous sound is generated by whatever sound-producing instruments, *exists in all matter and space*, not as audible sound, of course, but as its elemental basis, and which only requires the vibratory and atomic process ordained in the economy of Nature for transforming this force-element and thus calling it forth in that *definite form of force which we recognize as sound*. This same universal but indefinite force-principle, by the process of the battery or dynamo-machine, leaps forth in the definite form of electricity, with its own peculiar properties, and *which has no existence in that form in the air or battery until so transformed and evolved* from this force-reservoir of Nature. Clouds also act as a battery and produce a similar transformation. The same universal element of force, by the peculiar but mysterious relations of the atoms of the steel magnet, pour out transformed into the shape of *magnetic rays* of real incorporeal substance that will lift a bar of iron at a distance even through impervious glass. So also with the substantial light-rays, which are but another transformation from the same fountain or universal element of force, evolved to the sensible form of *light* by various processes ordained in Nature to that end. But it by no means follows that electricity is created out of nothing or returns back to nothing when its substantial manifestations cease; nor is it created out of the substance of the electro-magnets in the dynamo-machine *which will last indefinitely without the slightest wear or deterioration of their material substance*. So a locust, while thus generating substantial sound-pulses, not out of nothing, but evolving them from this same universal, sub-

stantial fountain or *force-element*, uses not a particle of its physical organism as a constituent of such sonorous form of force. The *fire-fly*, as the editor shows in the March MICROCOSM in reply to Prof. Goodenow, though but a hundredth part the size of the locust, can be seen half a mile of a dark night, and therefore must fill that much space in all directions with its substantial but incorporeal light-corpuscles which it generates at each flash from its thorax, not out of nothing, but out of that same force-element which pervades all Nature and supplies each force, when definitely evolved, with properties peculiar to itself. The physical substance of this diminutive insect has nothing to do with constituting that form of substantial force called *light*, since, after thus filling hundreds of cubic miles night after night with actual substance, it has not exhausted its coporeal structure in the least! But what becomes of the *light*, the *sound*, the *electricity* the *magnetism*, or any other peculiar form of force thus generated, after serving the purpose thus designed in Nature, or after ceasing to manifest itself? It falls back from its definite form into the same indefinite force-element or reservoir from which it was evolved by the process appointed in Nature; and *thus only can the law of the conservation of the forces be true*. Thus also, as the founder of this Substantial Philosophy teaches in his *Problem of Human Life*, the vital and mental force of the lower animals at death falls back into the universal fountain of life and mentality from which all substantial life and mind must have originally come, and which reaches back to God himself. He insists that no scientist dares to deny him the right thus to postulate such a universal force-element or fountain from which all forms of manifested force with all their peculiarities come, since this Philosophy solves so many otherwise absolutely inexplicable problems in science, while contradicting nothing that we know surely in any branch of natural philosophy. It would be with an ill grace for scholasticism to deny this right to assume a universal force-element which rationally solves all the mysterious phenomena of science and which have so long puzzled the schools, when the same scholasticism assumes an all-pervading and *material* luminiferous *ether* for the sole purpose of getting a substance out of which to manufacture light-waves and thus to make light harmonize with an erroneous theory of sound-waves, and all, too, without any rational necessity either for such assumption or such a substance.

But in conclusion, take one more case which the author of the new theory cites as an illustration of the importance of Substantialism in giving a rational solution of Nature's mysterious problems. The flint and steel are perfectly *dark*, *cold* and *silent* bodies. Neither *light*, *heat*, nor *sound* addresses our senses as we *look* at them, *feel* of them, or *hold* them to our ears. But bring them together in suitable substantial contact and forthwith there leap away from them a ray of substantial *light*, a flash of substantial *heat*, and a hiss of substantial *sound*! Where were these three substances or forces concealed before this contact? Had they no existence in any form, and were they therefore created out of nothing? By no manner of means. Plainly, as Substantialism answers, they were all previously locked up, in essence at least, in the all-pervading force-fountain of which we have been speaking, and they only required this substantial contact of the two material bodies to enable them to come forth in the three manifested forms of definite and substantial force as observed. Such are a few of the

beauties of the Substantial Philosophy now appealing to the people through the columns of WILFORD'S MICROCOSM.

[NOTE: It turns out that instead of printing the entire article as here given, the *Standard* gave less than half of it, quitting at the paragraph ending "true science"; thus leaving out the most valuable portion of the reply. Whether or not this omitted portion will appear in the future, remains to be seen. The "Office Editor" who, it turns out, is the writer of the criticisms in the *Standard*, commented quite severely upon that portion of Eld. Munnell's article which he copied. This criticism, with the Elder's response, will appear in full in THE MICROCOSM next month, and will afford lively reading to scientific thinkers. EDITOR.]

GOOD CHEER FROM OULD IRELAND.

The Rev. Joseph Jones, of Belfast, Ireland, a warm-hearted Irish clergyman, has become decidedly enthusiastic over the Editor and his work, claiming him as a veritable son of Erin.

We make the following extract from his last sparkling letter, for the benefit of our Irish-American subscribers:—

"Dear Doctor.—I am happy to say that THE MICROCOSM, and *Universalism Against Itself*, came safely to hand on the 12th inst., and to say that I am well pleased with them would be saying very little indeed. The first thing I have to say is that Dr. Hall is manifestly an *Irishman*. No such grand old oak could grow amid the prairie grass. May that tree live forever. The next thing I have to say is this, and without exaggeration, I consider the grand, magnificent, majestic, and beautiful portrait in the front of the book, worth the whole of the money I sent. I have no hesitation in declaring the author and editor, the Shakespeare of America; and if I can't get another copy of this picture I will cut it out of the volume and have it placed in a frame to ornament my drawing-room, for certain I am, "I shall never look upon his like again." I feel doubly grateful to my dear, dear friend, the Rev. Dr. McCabe, of Delaware, Ohio, for bringing these works under my notice. I trust their author will be long spared in health, and strength, and vigor of mind, to accomplish the great work he has on his hands.

"And so I remain very truly yours
"JOSEPH JONES."

PROF. VAIL ON THE ANNULAR SYSTEM.

We give the concluding paper of Prof. Isaac N. Vail on the Earth's Annular System. The whole discussion is most ingenious and of great scientific interest, though it may differ in some respects from many literal interpretations of Scripture. Possibly a due allowance for figurative or allegorical expressions common in the sacred writings, may yet make the truly philosophical and truly scriptural views agree perfectly as they evidently should on this beautiful view of the subject as presented in these papers.

Prof. Vail's whole work (of which specimens only have appeared in THE MICROCOSM) should be issued in the form of a book. The Professor writes us that it will make a book of 400 pages octavo, and will cost not more than \$2.00 per copy, possibly less. He would like to know how many readers of THE MICROCOSM would want such a copy. If encouragement enough is received he will venture its publication. Address him at BARNSVILLE, OHIO.

WILFORD'S MICROCOSM.

23 Park Row, New York, May, 1884.

A. WILFORD HALL, Ph.D., Editor and Prop'r.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

THE SUBSTANTIAL PHILOSOPHY.—No. 2.

[From the *Christian Quarterly Review*.]

BY A. WILFORD HALL.

Hitherto some eminent religious philosophers have fully recognized the spiritual realm of substantial or entitative existence, teaching that our future homes will be real spiritual residences, with substantial but spiritual environments, and that we will possess substantial spiritual bodies the counterpart of our physical organisms here, all of which is in strict accordance with apostolic teaching in numerous passages of the New Testament. But it remained for Substantialism to carry this principle into the realm of physical and natural science, and to establish by demonstrative evidence that the physical forces or so-called "modes of motion" in natural philosophy, as well as the vital forces, were all real but immaterial substances, and that, too, without a single exception. Thus the Substantial Philosophy is based upon the revolutionary idea that while spiritual substances, including the higher moral and rational powers of man, are all that theology and Christianity lay claim to, they form but a small fraction of the immaterial substances of Nature. The new Philosophy claims that the spirit and intellect of a Newton are no more a real substance than is the instinct or mental power of a worm, by which it seeks food or is warned to flee from danger; that the spirit of an archangel is no more a real substantial entity than is the vital force that enables a bird to lift its wings under the direction of its limited but substantial instinct, or the vital energy in the tree that makes it bud, leaf, blossom, and bear fruit. All are alike real entities, but of different gradations of refinement in the immaterial realm of substantial being. And the reasons why the possibility of immortality or a future conscious existence attaches to the spirit or intellectual powers of man, including his vital and sensuous being, while the mental and vital entity of lower animals falls back and re-absorbs into the vital and mental fountain of the universe, thus obliterating their individuality, are problems fully discussed in our earliest treatise on this subject,—*The Problem of Human Life*,—and will again be alluded to at the close of this paper. But although we cannot enter into that branch of the discussion here, we will only say, that notwithstanding the individual identity and consciousness of animate beings below the human plane will thus cease at death, the substance of the vital and mental powers of all such lower animals, down to the very lowest, is in no wise blotted out of existence at death, nor can it be annihilated any more than can God annihilate Himself or cease to exist. But all vital and mental substance, which is not schooled here to identify its owner with a state of personal immortality, goes back into the primordial fountain of substance and again becomes a part of the source whence it originally emanated.

Here is where Substantialism is not tied to the limitations of previous systems of philosophy, though including in it at the same time all that theological science properly embraces as clearly taught in the Christian Scriptures.

And thus can the new Philosophy be consistent with itself and with all known truth, ignoring no force in Nature either vital, mental, physical, or spiritual as a real substance, and thus also can it remain consistent in refusing to believe in the possible annihilation of substance of any kind, as well as its possible creation out of nothing.

But most important in the revolutionary work of Substantialism is the fact that it reinforces the church and all true religious philosophy in their claim for the possible existence of real immaterial substance in the spirit realm, by its invincible assault upon some of the chief theories of physical science, thus overturning all the so-called "modes of motion" in natural philosophy, and even demonstrating that *Sound* itself (the representative "mode of motion," and upon which confessedly all the others have more recently been formulated) is a substantial emanation analogous to that of odor, and that air-waves or tympanic vibrations, as the cause of sound, have no foundation at all in true science. As the current sound-theory admittedly represents materialism, lying as it does at the foundation of all the anti-substantial modes of motion in physics, and as it is believed in and taught universally as infallible science, never having been called in question by any physicist during all the past centuries of investigation, it was most fitting that the Substantial Philosophy should overturn this representative theory before laying any claim to universality. This essential achievement—essential to its very existence as a true Philosophy—it claims most successfully to have accomplished.

But leaving these generalities, let us come down to the more detailed particulars of this new departure in philosophy, and devote ourselves a little to argument. We feel, for example, the incorporeal *heat-rays* as they act upon our cuticle, and at the same time note their physical effects in melting ice, in turning the solidest bodies into liquid and molten masses, then converting these liquids into vapor, and at the same time consuming combustible materials into ashes. Is it reasonable to suppose, as science teaches, that this heat, as one of the physical forces of Nature, which can accomplish all this, is but a "mode of motion" of an unproved and unrecognizable *ether*, and that the heat which does all this is not an entity or anything substantial? We believe that the very attempt to ignore heat as a substance,—a force that will pass through a perfect vacuum and produce the corporeal effect of melting ice,—would strike a philosophical mind as a self-evident absurdity, especially if such mind had once become convinced that the existence of immaterial substance was a possibility in Nature.

We also recognize the existence of light-corpuscles by their manifested effects upon our eyes in making objects visible to us at a distance. Then by the eyes of our reason we can see also the cords of incorporeal gravital substance pulling at the apple till its stem severs and it is dislodged, "falling," as we express it, to the ground. But it no more falls in reality than the fish falls out of the water into the air when drawn by the fisherman's line. It no

more falls, scientifically speaking, than the iron bar falls up toward the poles of a magnet held over it. The bar is drawn up (just as the apple is drawn down) by the invisible, intangible threads of magnetic substance continually emanating and returning from and to the magnetic poles, seizing whatever material body is in sympathetic affinity with its own incorporeal corpuscles, and it thus either draws or repels the body seized according to the occult manner in which the molecules of the two substances interlock and commingle. But in the action of the corpuscles of gravital rays, unlike those of magnetic substance, it seems there is no repulsion, gravity consisting alone of sympathetic pull.

The same conclusive proofs of the existence of real immaterial substances, beyond the domain of materiality, are witnessed also in the action and effects of electricity,—that all-pervading life-substance of the physical realm. That electricity is really substantial, and terribly substantial at times, we need no stronger proof than the fact of its instant destruction of life should man or beast come in suitable contact with a wire conveying its invisible current. Can any one imagine anything less than a real substance that will utterly demolish a forest tree, scattering its splinters over acres of ground? That it is an immaterial or incorporeal substance, without possessing a single property of matter, is demonstrated, so as to leave not the slightest room for doubt, by the observed fact that it passes through solid iron wires almost with the speed of light, and without marring their fibre or perceptibly impeding its own progress. Some have denied that electricity passes through the body of the wire but only courses along its surface. But this is disproved by the fact that all parts of the body of the conducting wire commence to glow and show incandescence at the same instant, as seen by the effect of a heavy current of electricity.

The truth is, this immaterial substance passes through the entire material substance of the conductor at enormous velocity, just as sound passes through and permeates every atom of the conducting medium, whether it be air, water, or iron, or just as light permeates and passes through every part of a diamond or crystal. Why not claim that light only travels along the surface of crystals and that it does not enter their substance?

It is also claimed by others, in order to evade the substantial nature of electricity, or the possibility of its passing through material bodies, that it is not a fluid that travels at all, but that the wire is already charged with it from end to end, and that this resident electricity is made to act bodily throughout the whole wire on attaching the battery. But this supposition, while explaining nothing, will not hold good, since it cannot account for the wire's becoming red hot and even melting with a more powerful battery; since this resident electric condition could not be increased to such intensity only by the addition of the incorporeal fluid that must enter and travel through the material texture of the wire in larger or smaller quantities, as the case maybe. While this fact demonstrates electricity to be a real substance that travels through the wire, it just as conclusively shows it to be an

immaterial substance, since it permeates and passes through material bodies in defiance of material conditions.

In like manner substantial magnetic rays will dart off from the poles of the steel magnet, and in defiance of all material conditions will pass through sheets of physically impervious glass, seizing and moving the iron armature on the opposite side with the same force precisely as if nothing intervened between the magnet and the armature. This experiment was one of the chief demonstrations we had the pleasure of making in the presence of our friend Mr. Smith, at Cincinnati, and which, as he admitted, was alone sufficient to prove that a real and effective substance may be absolutely immaterial, and from the force of which conclusion he frankly confessed that he saw no insuperable objection to the possible existence of the soul after death, or even to its *probable* existence, provided other corroborative evidence of such hypothesis could be adduced. Such was the weight of this proof, by the action of the magnet, upon the clear intellect of that philosophical materialist that he absolutely stood in awe of the invisible but real entity that would thus dart through sheets of glass, as if nothing intervened, and lift bedily a piece of inert iron.

This experiment, which any one having a common horse-shoe magnet can easily try, furnishes a scientific demonstration in favor of the positive existence of immaterial substance, and of the possible conscious existence of the soul after death, as well as of the probable existence of a personal God, that ought to be sufficient, properly carried out, to remove the gravest doubts from the mind of any unbiased and candid atheist. If an unintelligent substance like magnetic rays, having no material property whatever, but defying all material conditions, though emanating from a material source, can exist as a real entity in open space actually separated from its source, and can dart through the most impervious material substances known to mechanics, seizing and bodily displacing ponderable material objects, is it unscientific or irrational to believe and hold that an intelligent substance, like the conscious human soul, and the accompanying vital force that moves our bodies, may also exist as active and real entities in a separate state of being? How this single argument, based on the action of incorporeal magnetism acting with all its force and without the least curtailment through the most impervious material bodies, can be answered or set aside by the materialistic scientist, is beyond our powers of conjecture. That an actual substance passes from the magnetic poles through the sheets of glass and returns in circling currents in some mysterious way to draw the armature or push it, as the case may be, it is utterly impossible to dispute, or else it is a physical, mechanical result without a cause to produce it—a self-evident fallacy. The modern scientific “mode of motion” theory will not avail here in the least to explain this, by trying to make out that the intervening air or other substance is thrown into molecular vibration by the magnet, thus acting upon the distant iron, &c., as a mode of motion. Aside from the impossibility of such mere vibrational tremor (did it even occur) pulling or pushing

any object, it is plain that such motion can not be the cause, since motion from a given source necessarily weakens in proportion to the quantity of matter to be passed through and moved, whereas the distant armature is pulled with precisely the same force, at a given distance from the magnet, whether one sheet or a dozen sheets of glass intervene, or whether or not any solid substance whatever intervenes. But the best proof that the vibratory motion of the connecting medium has nothing to do with the cause of displacement in the armature, is the fact that a piece of iron suspended in a vacuum (even as perfect as a Torricellian tube) is acted on by an outside magnet with the same force exactly as if the entire intervening distance were filled by air or by any other substance that might be supposed to be thrown into vibration. Thus the mode-of-motion doctrine in the case of magnetism falls to the ground, as it totally fails to account for the action of a magnet on a distant body, leaving magnetic force, as an undeniable incorporeal substance, in peaceable possession of the field. We challenge the scientific world to make any reply to this argument for the absolute existence of immaterial substance,—an argument which alone annihilates the mode-of-motion doctrine as applied to other natural forces, leaving them all *entities*, just as required by the Substantial Philosophy. For, plainly, if magnetism is thus proved to be a real substance, by the utter inadequacy of any mere motion of material substance to explain the facts, then gravity must follow as a real, immaterial substance, by applying the very same line of reasoning and illustration; and if these two forces of Nature are thus indubitably shown to be substantial emanations, why not all the others? The argument thus seems absolutely conclusive.

Indeed, may we not claim it to be a truism, so well settled in the very texture of science as to entitle it to be received as axiomatic by any mind capable of philosophical thought, that, as no ponderable body can move of itself, so no body, such as the iron armature referred to, can move unless acted upon by a real substance emanating from some source of power? Can any logical mind dispute such self-evident truth? If not, then have we not, in the most convincing manner, demonstrated in magnetic attraction and repulsion an active, powerful substance existing entirely outside of the domain of materiality, which defies all material conditions or material explanations, and which has not one material property?

True, this magnetic substance appears to cease to exist when it ceases its manifestations. But it does not and cannot cease to exist, in the very nature of things. As it is admitted to be a real *force*, the theory of the “conservation of the forces,” now accepted as science, precludes the possibility of such magnetic substance being annihilated. Whatever becomes of it, and however it may be dispersed throughout space, or be diffused so that its active effects cease to be recognized by us, it nevertheless continues to exist in some essential and substantial form, or the so-called “conservation of the forces” of Nature cannot be true.

Here, then, is where *Substantialism* practically began. Here is where it drove its first stake, pitched its tent, and from which point

it took its first philosophical bearings. If one of the acknowledged physical forces, namely *magnetism*, is thus shown to be not a mere technical vaguity or meaningless myth of science, but a real immaterial substance, as we have here found it to be, then reason would tell us, yea does tell us, as just intimated, that every other force is equally substantial, *unless some insuperable difficulty shall be found to interfere which necessarily precludes such substantial hypothesis*. But no such interference in any of the forces, after the most critical and searching investigation, occurs. On the contrary, rather, once admit the existence of immaterial substance as a settled fact, as magnetism compels us to do, and then admit four of the natural forces—*magnetism, gravity, electricity and heat*—to be really substantial, as the first one irresistibly forces us to do, and is it reasonable or philosophical, after such data, not to include every other natural force, or whatever produces sensuous manifestations, in the same category? Thus logically we were lead step by step into Substantialism.

The chain of reasoning which was brought to bear, after this first or initial ratiocination, upon *electricity, gravity, heat, light, vital energy*, one after another in succession, left no doubt whatever remaining that each and all were as really immaterial substances as were the magnetic rays that lifted bodily the iron armature even when hermetically sealed in a vacuum.

At about this juncture in the broad formulation of the Substantial Philosophy we were first practically and seriously brought face to face with the *sound* problem, and the apparent overwhelming difficulties lying in the way of a satisfactory reconciliation of observed sonorous phenomena with the demands of Substantialism. We saw plainly that here the real difficulties in the onward progress of the new departure were to be encountered, and that here the decisive battle of the Substantial Campaign was to be fought. Indeed, not only was a new System of Philosophy to be founded, but to clear the way for it and to make its claim to universal acceptance unquestionable, a New Theory of Physical Science had also to be established, and that, too, upon the ruins of another theory which had been considered so well settled that not one scientist, living or dead, had doubted its truth since its origin centuries ago! Surely a most herculean task was now upon our hands.

About this time we had fairly begun to count the cost. We had in fact reached a crisis in the affairs of Substantialism, where the whole Philosophy turned upon a single pivot, and that pivotal point was the correctness or incorrectness of the accepted theory of acoustics. Either the superficial appearances of vibrating instruments "swiftly advancing," atmospheric tremors near such instruments, sympatheti vibrations, etc.—all seeming to favor the wave-theory—must be susceptible of different explanations, or Substantialism must come far short of realizing its claims as a universal Philosophy, which of course would be equivalent to its final failure. Here was enough to make a timid investigator quail, and well might it cause some hesitation, as it did,

in the face of thousands of colleges and universities, and tens of thousands of professors of physical science, all of whom were certain to laugh with contempt whenever such a preposterous idea was suggested as that the wave-theory of sound was false.

To attempt to show sound to consist of corpuscular emissions or substantial emanations from the sounding instrument, somewhat analogous to the discharges of electricity from the dynamo machine, was at once to involve the necessity of explaining in harmony with Substantialism all the apparent phenomena of air-waves which had at first led to the wave-theory and which had kept it established for so many centuries. Could this be done? was the paramount question. On this single problem the New Philosophy now really seemed to depend for its existence. Nature or true science, the same as true religion, we felt sure could not contradict itself. Harmony, consistency, and absolute unity must reign among the principles and laws of God's natural system of things. If any apparent conflict occurs, it is surely a defect in our methods of investigation and reasoning, and can in no way be chargeable to the system of Nature. Not one truth or fact in true religion can conflict with any truth or fact in true science, and *vice versa*. Equally true and self-evident must it be that no fact or true principle of science or natural philosophy can ever be found to conflict with any other fact or principle of true science or true philosophy. Hence, as our investigations all the way through the other natural forces, or manifestations of active power over material things, had successfully and beyond a doubt shown them to be incorporeal substances, as in the case of magnetism, gravity, electricity, heat, vitality, etc., why should we here in the department of *sound* meet with a single stumbling-block in Nature to thwart our purpose?—an abrupt departure from the substantive principle in an arbitrary and unnecessary process of producing sensation by such a radical change as a mere *motion* of the sense-organ, when the contact of substantial corpuscles, as in the case of odor, would, in all human reason, have answered the purpose better, and thus have maintained the harmony, unity, and consistency of Nature? We could not bring ourself to believe that Nature would thus trifle with her physical laws, or work incongruously and arbitrarily; nor could we believe that the God of Nature could thus conflict with Himself by inharmonious designs where no necessary end would thereby be attained. Hence, we were forced to reason,—if *smell*, the next adjacent sense to *hearing*, receives its impressions from the contact of infinitesimal corpuscles, and without any wave-motion of the air or corresponding vibration of the nasal membrane whatever, why should Nature make such an abrupt leap in principle as to produce the sensation of hearing by the entirely unanalogous method of mere motion to and fro of the auditory membrane, while letting the nasal membrane remain undisturbed? Why make the contact of the imponderable corpuscles of the odorous body operate on one sense-organ (*smell*), and not act on the next adjacent sense (*hearing*) in

a similar, or at least analogous, manner? Is it reasonable that the wise Organizer of the system of Nature would use corpuscular contact for one sense, and then totally depart from that principle without any conceivable necessity for so doing, and produce the next sensation to it by merely vibrating the organ itself? We do not believe that any such incongruity is chargeable to Nature's harmonious system of laws and operations.

(Concluded next month.)

PROF. COMSTOCK ON ELASTICITY.

THE APPARENT SELF-CONTRADICTION OF INERTIA FOR THE FIRST TIME EXPLAINED.

As intimated last month, we have a long paper from the pen of Prof. Comstock, of Knox College, Galesburg, Ill., partly on the elastic transfer of Force, and partly on other matters, all aimed, however, to defend the wave-theory of sound against our attack. And here we apologize to our readers for these lengthy discussions of elasticity, the *transfer of force*, and the unavoidable matters growing out of them. These questions lie absolutely at the basis of the received doctrine of acoustics. If the views of the text-books—the school-philosophies which all young men are now taught—be correct on this elastic-transfer question, as clearly expounded by Professors Goodenow and Comstock, then the wave-theory of sound is correct, the locust can and does shake four cubic miles of air, and one of the imponderable forces is plainly proved to be but a "mode of motion," and consequently *Substantialism*, as a broad Philosophy, is false. And if all this be true, then it follows inevitably that the life-force which moves our bodies, and the intellectual and spiritual forces which direct these bodily movements in man, may be, and probably are, only various modes of molecular motion of the brain and nerve-particles, as Haeckel and Huxley teach, and consequently, when the brain particles come to rest at death, all life and thought cease to exist, as does all other motion when the moving body ceases to act. The final consequence is that the doctrine of immortality is a hoax. Hence the necessity, as our more intelligent readers will see, of the most thoroughly analytic and sifting discussion of this fundamental question of physical philosophy. The reader will therefore study the whole matter with patience and care, if he wishes to derive benefit from the same.

The article communicated by Prof. Comstock was written before he had seen our review of Prof. Goodenow's article in the March number. Had he waited till he had read that critique, his entire argument on the elastic transfer of force might have been spared, as he uses the same experiments from the text-books for his illustrations that Prof. Goodenow employed, such as rows of suspended elastic balls, showing how the force is thus transmitted through them, etc., just as if that helped the wave-theory. He also falls into the same fatal and inexcusable error that Prof. Goodenow perpetrated, in totally ignoring the factor of *inertia* in the displaced balls, thus, as we claim, rendering his entire argument nugatory and worthless. Hence we cannot spare space to print that part of his paper, thus giving room to the same positions and arguments twice, as it would involve a repetition of the same replies and arguments on our part. Next month, however, we will print the new portion of his article complete, as it relates to the slow motion of the tun-

ing-fork's prong, and we will endeavor to show up the manner in which he treats our "finishing demonstration" as carried out in Capt. Carter's Report.

But notwithstanding our long discussion of the elastic transfer of force in reply to the chief arguments of the text-books as presented by Prof. Goodenow, there is something vastly newer and still more important to be presented and considered on that subject than has yet been said, and some of Prof. Comstock's positions and admissions, it must be confessed, aid this new eclaireissement by completely outstripping those of Prof. Goodenow. We will make one or two ample quotations from his present article to illustrate this fact, comparing them with the teachings of Prof. Goodenow, and thus show what disastrous work the acutest scientists will make when left to themselves in trying to defend the wave-theory against our locust-argument. Here, for examples, is one full statement copied from Prof. Comstock's paper *verbatim* :—

"If elasticity were perfect, if there were no resistance from the presence of air, and if no force were required to bend the threads sustaining the balls [not a word about *inertia* or the force expended upon *indentations*] a force impressed upon one end of the row *would be transmitted to the other end and every ball would be moved in succession, whether there were a dozen or enough to go around the world 440 times!*"

This is as frank as it is ridiculous. Prof. Goodenow, it is true, used the expressions "any number of balls," or a row extending "any distance," "indefinitely," etc., which no doubt means the same thing, though obscured somewhat by verbiage. But Prof. Comstock deserves more credit; he is preposterously explicit and unmistakably reckless in specifying the length of the row, — 10,000,000 miles,—and the weight of the mass of ivory or other elastic matter,—about 20,000,000 tons,—thus agreeing precisely with our calculation in the February number, that the displacement of the 20,000,000 tons of suspended air-particles would require the same force to be exerted by the insect as to displace the same weight of solid elastic balls freely suspended. Prof. Comstock has thus agreed fully with our position that with perfect elasticity (even *in the air*, as the suspended air-particles are surely not in a vacuum), a locust has the power we have from the start claimed that the wave-theory attributes to it, since the insect, by its individual strength, could certainly move the first ivory ball against the end of the row, say one quarter of an inch. Let it, therefore, never be charged again that we have misrepresented the wave-theory in making it teach that an insect, by stridulating, shakes millions of tons of ponderable matter alone by its physical strength. Prof. Comstock now admits us to be right, in one of the most explicit statements on record.

But is it possible that any one able to read and understand a common-school philosophy cannot detect the fallacy of the Professor's strange statement just quoted? As intimated, neither he nor Prof. Goodenow takes the slightest account of the *inertia* of the 20,000,000 tons of suspended matter that has to be overcome by the physical strength of the locust, nor of the countless millions of *indentations* in the hard surfaces of all the balls in this mighty row, *each of which indentations requires the expenditure and consequent neutralization of a part of this striking force!* Without *indentation* no transfer of force by elasticity is possible, as Prof. Goodenow admits. But while they both provide against the trifling

resistance of the air, and even the inappreciable resistance encountered in bending the threads supporting the balls, they both leave out these two vastly greater factors involving thousands of times more resistance than what they so carefully take pains to specify! They thus, in Scripture language, strain at an insignificant gnat while swallowing a prodigious camel, humps and all. This phase of the problem before us will be fully discussed and illustrated after we have prepared the way.

But first, to illustrate the fallacy of the statement just quoted from Prof. Comstock, and to show the surprising error he commits in leaving out the single factor of *inertia*, let us describe an experiment or two which we have recently tried at our office in the presence of scientific witnesses. It is known and admitted that *glass* is the nearest perfectly elastic of any solid substance—even superior to ivory in that respect. Now we have a solid glass rod *one inch and an eighth* in diameter, and *two and a half feet* long. Instead of a row of balls, we suspend this rod horizontally by long threads with one solid glass ball, of the same diameter at each end, also suspended so as just to touch the rod. We now withdraw one ball *four inches*, and let it fall against the end of the rod, and if Prof. Comstock's statement about a row of balls 10,000,000 miles long, or Prof. Goodenow's statement to the same effect, be one ten-millionth part correct, then the *force* and *motion* of the dropped ball should certainly all be given up to this short glass rod, go through it undiminished as an elastic pulse, and send off the far ball the same distance, or *four inches*. Instead of this, however, the dropped ball actually rebounds *three inches* on striking (having so much less *inertia* to be overcome than the rod), while the pulse transferred through the rod *only drives the farther ball away about one quarter of an inch!* This is absolute scientific truth, and we invite any reader of THE MICROCOSM, near enough, to call at our office and witness this experiment. We thus demonstrate that, if this most elastic of all solid substances should extend only two or three feet farther, no pulse whatever would pass through it to the distant ball, *even by a blow of hundreds of times greater force than a locust could give!*

It would scarcely seem necessary to stop here, at this late day, to demonstrate *inertia* as a positive factor of resistance in the displacement of all ponderable bodies however freely suspended or equipoised,—a fact which these scientists absolutely ignore. It was supposed that every scientific thinker or even beginner in science recognized this law. Even a perfectly balanced beam (fulcrumed without friction and in a vacuum), if loaded with a ton of metal at each end, could not be *suddenly* started into oscillation without great resistance from *inertia*, though neither end, as thus balanced, weighs anything. What it is that causes this *inertia* is a problem to be solved in the future if at all. We assert that it has never yet been fully solved, though that it is a positive factor of resistance all experience shows. Even in the above named experiment of the glass rod we have an unexpected demonstration of its truth which is as clear as any proposition ever submitted in common mechanics. The simple fact that the striking ball itself rebounds three-fourths the distance it falls, while the rod, equally suspended and of the same material, barely stirs, with a very slight pulse going through it, should be, to every young student, a sufficient demonstration of the part *inertia* plays in all such phenomena, namely, *resistance to displacement in*

exact proportion to the effect gravity exerts upon a given body if weighed,—usually denominated "mass of matter."

The same infallible law holds true, as we show in another experiment, where two elastic balls of *different size* are suspended by long threads so as just to touch. Let the small one, weighing, say one ounce, fall against the large one, weighing one pound, and the small one will rebound nearly three-fourths the distance it fell, owing to difference in *inertia*, while the large one will be displaced less than one fourth as far! But let the large ball be dropped with the small one at rest, and the small one will be driven away by the collision with increased velocity over that of the large one, while the latter will follow and continue swinging at a lessened velocity proportioned to weight, thus again demonstrating the factor of *inertia* in exact proportion to mass. To ignore this resistance of *inertia*, as do these scientists whose teachings we are now analyzing, would be to claim in defiance of fact that the ounce-ball does not rebound at all on striking the pound-ball, but that it gives up its force, coming to rest, thus driving the pound-ball away. Why not, if *inertia* would count for nothing in displacing a row of balls weighing millions of tons?

But, say these scientists, here is the stubborn fact, that a row of suspended ounce balls, weighing a pound in the aggregate and touching each other, will all be slightly moved, and the farther ball will be driven away by letting one of the balls drop against the end of the row, while that striking ball will give up all of its force on account of *elasticity*, and come to rest, *thus showing that there is no resistance from inertia in the premises!* Thus, reader, do the text-books and professors leave science at loggerheads—in point-blank contradiction—from the mere superficial appearances exhibited in the action of such a row of balls. They know that an ounce-ball will rebound on striking a pound-ball on account of difference in *inertia*, just as we have described it; but they shut their eyes to the contradiction which they produce in their experiment with a pound-row of ounce-balls by simply attributing the transfer of the force to *elasticity* without trying to explain how *elasticity* does it, and the apparent absence of *inertia* in the row. Neither Prof. Goodenow nor Prof. Comstock ventures a word about this manifest self-contradiction as it is left by the text-books. But THE MICROCOSM does not propose to leave Nature's laws thus by the ears, without at least trying to reconcile them. We believe that this apparent discrepancy can all be made clear by a very brief explanation, to a mind capable of close scientific thought, and that when once elucidated, it will throw a flood of light upon the main fallacy of the wave-theory of sound, as taught in all our philosophies. The mystery in this problem, in the first place, consists in the fact that the pound-row of ounce-balls must of course have just as much *inertia* to be overcome as has the single pound-ball, being of the same weight; but while the striking ball bounds away from the single pound-ball about three-fourths as far as it falls, thus demonstrating the due effect of difference in *inertia*, it does not rebound at all from the *row of balls*, but gives up its entire force and comes to rest in apparent defiance of the same law of *inertia*! Thus investigators leave it as the work of "*elasticity*" without pretending to explain why or how *elasticity* can thus act in conflict with the well-established laws of Nature. Had the authorities stopped to ask this question, and had they been able to answer it, and thus explain this apparent discrepancy in the law of *inertia*, there

would have been a new chapter incorporated into our school philosophies, which would have enlightened both teachers and pupils. But to assert loosely that this peculiar action in the case of a pound-row of ounce-balls is the work of *elasticity* in the process of transferring force, is no explanation at all, since there is the same *elasticity* in the single pound-ball of the same material as well as the same *inertia* to be overcome as in the row. Why, then, does this ounce-ball, which rebounds from the pound-ball, come entirely to rest when it strikes the end of the row of balls of the same aggregate weight? Let us undertake the solution and try to see if a little light cannot be shed upon a matter left totally in the dark by the text books.

The first thing to do in attacking the problem, is to look into the details of the phenomena presented. The reason why the ounce-ball rebounds on striking the pound-ball, displacing the latter also proportionately to mass, is because we have the three simple factors of *force*, *inertia* and *elasticity* involved without complication with any other factor. But second: the reason why the ounce-ball gives up its force and comes to rest when striking the end of the row and transferring its force, thus driving the farther ball away, is, because there is a new factor here introduced, namely, *the numerous fine points of contact for indentation between all the different balls throughout the row.*

The actual *points of contact* between any two perfect spheres with perfectly smooth surfaces touching each other, are no larger than the points of needles. Hence the force required to indent thirty-two of such delicate points of contact is quite inconsiderable even in as hard an elastic body as glass or ivory. This ounce-ball in falling against the pound-ball has but two of these delicate contact-points to yield under the blow, and thus aid the ounce-ball in giving up its force; but as there is the whole inertia of a compact pound to be overcome at the same instant; hence before this can occur, and the pound-ball get under way, the two elastic points indented throw the bulk of their reactive motion upon the smaller mass, thus driving the ounce-ball back before its blow has time to drive the larger ball forward. But not so in the row of sixteen balls. There are, as already intimated, thirty-two of these fine points of contact to yield under the force of the blow of the striking ball, and to give way in rapid succession, thus allowing the striking ball to come gradually to rest as if *cushioned*; while these contact points compressing together, like so many tiny springs, with the whole force of the striking ball thus stored up in them, react continually forward and finally give up their surplus power to the farther ball in the row, sending it away, not as far as the striking ball fell, by any means, as the text-books and as Professor's Goodenow and Comstock erroneously teach, but as far *minus the force necessarily absorbed or neutralized in producing the thirty-two indentations and the consequent minute forward displacement of the sixteen balls!* As all the sixteen balls are of the same size, there is no greater static inertia to be overcome in each successive displacement, before the next ball is indented, than equals the moving inertia communicated by the falling ball. Hence there is no rebound of this striking ball, but instead of it, the last ball in the row, receiving all the force left over from the work of indentation, and having no ball in front of it to be indented, finds it easier to move forward itself by the restoring action of the last two indentations that for these tiny springs to

react backward again indenting and displacing the whole row. Hence the last ball in the row moves forward as the easiest thing under the circumstances, and no more work of indentation occurs in the row till this ball returns and strikes, when the same series of indentations, precisely as before, is sent through the row in the opposite direction (only considerably reduced in mechanical force), with the same results of rest of the striking ball, displacement, etc. This is the simple explanation of the reason why the striking ball each time comes to rest, and why the last ball in the row *moves away a distance proportioned exactly to the force remaining over after it has passed through the row and done its necessary work of indentation, etc.* But should the last ball be much larger than those constituting the row, its greater inertia would make it more difficult to move under the restoring action of the last two indentations, and consequently, before such large ball could get under way, the original force, transmitted from the striking ball, thus checked, would start back by the reaction of these last two indentations, and by reindenting the entire row would again finally reach the original striking ball, indenting it and *causing it to rebound with all the force left after making the circuit of two complete sets of indentations, displacements, etc.* Is not this plain? Yet it is an astounding fact that neither Prof. Goodenow nor Comstock takes the slightest account of this necessary expenditure of the force of the striking ball thus doing *mechanical work*, but lets it all go for nothing, claiming that the last ball in the row would receive the "whole force" of the striking ball even if the row were "indefinitely" extended or if it contained "any number of ivory balls," and that it would be driven away by *elasticity* the same distance that the striking ball fell, or "*as if it were the ball let drop!*"

We are well aware that modern physics teaches, and necessarily so, that a "*perfectly elastic body,*" in the act of restoring an indentation, or in the act of recovering its original form, would exert upon another or outside body an indenting force precisely equal in kinetic energy to the force which produced the original indentation. But how any person with a correct method of scientific thought could fall into such a fallacy is beyond our comprehension. Such reasoning wholly ignores the *molecular friction* of the elastic body encountered in making and restoring the indentation—a factor which is ever present and inseparable from such indentation and restoration—however elastic a body may be. *Perfect elasticity*, as we assume, is that property of a body, or that mysterious arrangement of its molecules, which permits the stored-up indenting force to return the said indented body to its original form without doing any other mechanical work—not as the erroneous text-books teach:—"Elasticity is *perfect* when the restoring force, whether great or small, *is equal to the compressing force.*" (Snell's *Olmsted's Philosophy*, Second Edition, page 58.)

Such a definition is superficial and demonstrably false on its face. Indent a perfectly elastic body, and if it reacts with the same amount of force that it took to compress it, it will, as a matter of course, produce an equal indentation in a similar elastic body if its whole reactive force is brought to bear upon it from the start of reaction. Whereas it is easily demonstrated that in exercising its entire reactive energy it only produces one-half as much compression in another similar body and then comes to rest. Such a

simple fact once demonstrated, away goes the elastic-ball experiments, as taught in the school philosophies. Here is the demonstration:—Air is admitted by most authorities to be *perfectly elastic*, and by others to be almost so. We assume that its elasticity is perfect, as it will entirely recover its original form after compression. Now, compress a given quantity of confined air into one half its bulk (supposing the sack containing it to be frictionless), and then let this spring react upon another equal mass of air, and it is manifest that instead of producing a compression of such mass to one half of its bulk, it only reduces it *one-quarter* and then stops work! If the latter mass of air, thus reduced in bulk one-quarter, is again allowed to react with its full recovering force on another equal mass, the latter's bulk will only be reduced one eighth; the next, one sixteenth, and so on; *each reaction losing just one-half of the force for external work that was exerted in producing the original compression.* Thus do we prove incontrovertibly that an indentation in an ivory ball, however made, can, on recovering form, produce only half as much indentation in the next ball in contact; that only half as much on the next, and so on; the reacting force for outside mechanical work thus rapidly being lost or converted into heat by molecular friction, a factor not named nor thought of by the great authorities on the elastic transfer of force.

How long, we now ask, would such a rapid rate of decrease in the reaction of a condensing force take to stop all progress of the locust's tiny indentations of the air, even if that were its process of producing tone? In like manner this fundamental law must assure us that all springs, of whatever kind, even if perfectly elastic, as in the case of Damascus blades, *can exert, by reaction upon another body, only one half of the force in mechanical work which was originally expended in their compression, the other half of this compressing force being of necessity converted into heat by the molecular friction of the elastic substance itself!* Plainly, if we are right in this revolutionary principle of physical science, as our illustration of atmospheric compression demonstrates, the very foundation on which the wave-theory of sound-transmission rests crumbles to powder. We cheerfully stake all upon its correctness, and believe that it is as new as it is true, and therefore challenge physicists either to invalidate its correctness or to show where an intimation of its existence has previously been recorded. Prof. Schell, our able contributor, standing at our elbow as we wrote the foregoing sentences, whispered audibly: "Dr. Hall, beware what you print! Such a radical and iconoclastic position in science is destined to startle the college professors from one end of the land to the other, and it will utterly ruin THE MICROCOSM should you be unable to sustain yourself." But what will be the result, we asked the professor, provided our position shall turn out to be invincibly correct? "Utter disaster," he answered, "to the present theory of sound, and immortality to the discoverer of the true law and explanation of the elastic transfer of force!" We accept the "utter disaster," as a foregone conclusion, but will let the "immortality" take care of itself.

Now, to make application of this new law of physics to our exposition of the ivory-ball problem, suppose the *indentations* (without which no elastic transfer of force could take place) should consume or utilize one half of the force of the striking ball, then it is manifestly plain that the ball at the farther end of the row could only be driven away by the surplus force left over after

this work of indentation, etc., was done, or about one half the distance that the striking-ball fell! Then put all these mechanical operations together, namely, this reduced displacement of the farther ball, the thirty-two indentations, and the slight bodily displacement of the whole pound-row, and it would precisely equal the mass-movement of the pound-ball added to the rebound of the striking ball, and the force expended on their two indentations, thus demonstrating the factor of inertia to be exactly the same in both cases! Instead of the manifest inertia involved in the mass-movement of the pound-ball and the recoil of the striking ball, the same amount of inertia precisely is involved and has to be overcome in the row, only it is strung along through the sixteen balls as described, and by the yielding of whose delicate contact-points alone the striking ball comes quietly to rest while transmitting its surplus force to the farther ball, driving it away.

That we are incontrovertibly right as regards this fact of the delicate contact-points being the sole cause of the striking ball's coming to rest, must appear manifest when we state, as another new discovery in physics, that if each of these balls were only *slightly flattened* at the contact-point, the cushioning effect would thereby be greatly lessened and the striking ball would consequently rebound from the end of the row, and this rebounding effect would increase with the increase of area in the flat surfaces of the contact-points, till finally the *same rebound would take place from a row of such flattened balls as from a single mass of the same weight!* In vain will the reader search the books for even a hint of any such radical explanations of these important physical phenomena. On the contrary, take all the illustrations laid down in the school-philosophies (based of course on perfect spheres without specifying or even suspecting any necessity for such shapes), and let our slight *flattening* process be introduced among their rows of balls, and at once the entire series of experiments, with their laws and explanations, would be knocked into *pi*, simply because none of these authorities has yet caught a glimpse of the true reason why the striking ball comes to rest against the end of the row, and thus transfers its force to the distant ball.

(We frankly admit that we have not tried this experiment of *flattening* the balls at the points of contact, but have reached the conclusion we have just stated alone by inductive reasoning. But so sure are we of its correctness that we fearlessly record the prediction and invite any professor of physics to prove us in error by actual experiment, if he can, and we will print it in THE MICROCOSM).

But delicate as are these contact-points before flattening, each indentation of the glass or ivory, even in a vacuum, must, as we have shown, cost some of the kinetic force of the striking-ball to produce it, on account of *molecular friction*. No one, with this law and its demonstration before him, except a firm believer in the wave-theory of sound, would think of disputing so simple a proposition, though such a believer we confess is equal to the task of accepting or disputing any proposition in physics however it may conflict or agree with self-evident truth, so long as he can accept the fact that a mere insect can shake 20,000,000 tons of ponderable matter with a mechanical force in addition sufficient to bend in and out, 440 times a second, 2,000,000,000 tons of ear-drums. The same law of force-expenditure must hold true of each of the

16 minute displacements in the row, since each ball must move bodily a distance exactly equal to one pair of these indentations, as Prof. Goodenow knows and admits, thus requiring the inertia of the entire row of balls to be overcome to that extent. Yet it is a fact that Prof. Comstock, as we have quoted from his article, takes no account whatever of this self-evident consumption of the force of the striking ball, but heroically declares that the same force and motion would continue on undiminished through a row of perfectly elastic balls 10,000,000 miles long if freely suspended in vacuo, and if the impulse were first given by the kick of an insect! This, reader, is a fair specimen of the teachings of modern science versus THE MICROCOSM. Please note the marked contrast. Is there any wonder that the teachers and students of the two thousand colleges and other institutions of learning where this magazine is read are beginning to open their eyes to the prodigious errors now being taught for science? We can here only express our regret that such a profound and independent investigator as we had supposed Prof. Goodenow to be, could have been misled by the text-books and so easily caught in this "elastic-transfer" misadventure. No reader will dare to assert that we have misrepresented the Professor, though we confess it looks almost like a deliberate slander. If any one doubts, let him turn to the Professor's article on the "Elastic Transfer of Force" in the March number of THE MICROCOSM, at page 241, and he will there find it recorded in his words, that "*just what the first mass does to the second, that second does to a third, and that third to a fourth, and so on indefinitely* provided the masses are all alike. Thus in the experiment, with any number of ivory balls, the force of the ball let drop is imparted to the next ball, and thence to the next, and the next; each stopping because the whole force has passed from it, except the last, which retains the whole force imparted and moves off as if it were the ball let drop."

Thus stands the fatal record against Prof. Goodenow. If the row should extend "indefinitely," with "any number of ivory balls," the "whole force" of the striking ball will go through to the last ball in the row, driving it away "as if it were the ball let drop." Not one syllable does he utter in regard to the force of each indentation (*one entire half*, as we have demonstrated) which is converted into heat or otherwise consumed. Not a syllable does he utter about the inertia of the entire row which has to be overcome, and which of necessity neutralizes a portion of the striking ball's force. He makes the entire force go through the row without diminution and drive away the last ball, though, as we have demonstrated, no indentation can possibly impart to another mass in the act of restoration more than one half of the mechanical force it originally took to compress it, even where the masses are perfectly elastic, as in the case of air. Such recklessness of assertion as that no force whatever is neutralized or converted into heat in the production of millions of indentations in a surface as solid as ivory, can only be regarded as a crime against science at this enlightened age of the world.

In concluding this long argument we ask in all candor, does not the solution we have given of the elastic transfer of force, with its manifest reconciliation of the apparent contradiction in inertia, and with the new laws and principles of physical philosophy introduced, appeal in unmistakable language to the common sense of the reader? And what text-book, we ask again, has ever presented any such explanations, or even intimated

that such problems in physics existed? We ask for information, and not at all in a boasting spirit, though we mean here, in self-justification, to place these inductions on record for all time to come, and upon which record we willingly risk our posthumous reputation for accuracy of scientific judgment.

From our experiments, as explained by the foregoing reasoning, we assert, confidently, that a row of the most elastic balls known, weighing one ounce each, need not extend more than six feet to dissipate or convert every iota of the force of the striking ball till no motion whatever will be communicated to the last ball in the row, even with a blow many times heavier than could be communicated by our locust. We challenge Prof. Comstock, in the interests of science to rig such a row of balls and make the test in the presence of his students. Dare he do it? We here publicly predict that he dare not. Yet he has the courage to write for publication, in defiance of the elementary principles of mechanics, that the force imparted by an insect to the striking ball would go *undiminished* through a row of perfectly elastic balls, free from impediment, extending 10,000,000 miles, thus producing 200,000,000,000,000 indentations in a surface as solid as glass *without exhausting any force whatever*, and consequently without any molecular friction in the indented masses! This he positively teaches, as does Prof. Goodenow, since the "whole force" goes through the row, driving the last ball away "*as if it were the ball let drop*"! Such philosophical reasoning is the same precisely as saying that a bullet fired with a given projectile force, would penetrate "any number" of pine boards, or a row extending "indefinitely" without the least diminution of its force and motion by frictional contact! A student of natural philosophy who could not see that each board added to the row, and that each indentation made, would necessarily consume or neutralize some of the original force imparted to the bullet till it would finally stop entirely, ought to be kept at home and made to work on a farm for the rest of his life, since schooling would do such a lad no good. Yet just such science (!) as this bullet illustration is gravely taught in our text-books as expounded by leading scientific professors.

THE REV. DR. SWANDER'S BEREAVEMENT.

We are pained to learn by letter from our esteemed contributor that his son, Nevin Ambrose Swander, departed this life on the 29th of March last, at his home in Fremont, Ohio. He was nearing twenty-one years of age when the fell monster—pulmonary disease—took him "from his home below to his home in heaven." His only sister, and the only other child of their parents, departed about four years ago from Tiffin, Ohio. Two hearts, now terribly stricken by this final calamity, would be inconsolable but for their firm belief in a substantial hereafter, where they are fully assured that a reunion awaits them and their dear departed ones.

From the Fremont papers, and from other sources, we have abundant evidence of the young man's excellent and even noble character, as a gentleman in the true sense, and as a Christian member of the Reformed Church from his twelfth year. His remarkable intellectual powers and great aptitude in acquiring knowledge gave him a most promising future and a host of the warmest friends, a fact which makes his death all the harder to be borne by his doting parents. He was to have graduated an A. B. the coming June.

His father, under advice of physicians, had taken him to Florida during the past fall, where they spent the winter together, in hopes of checking the ravages of the disease, but it was all in vain. So at the request of Nevin himself that he might go home to die, his father returned with him, and with a sad heart, to await the fatal hour which, as he wrote us on his return, was only a question of a few weeks at most. This explains to our anxious and inquiring readers why we have not been giving them an occasional paper from that pen whose outgivings never fail to inspire the highest intellectual pleasure and awaken the deepest interest. We can only express our profound and heartfelt sympathy for both father and mother in their affliction, and we feel sure that every subscriber of *THE MICROCOSM* will join with us in our condolence.

HERBERT SPENCER OVERHAULED AT LAST.

For years we have marveled at the high estimate that has, by common consent, been placed upon the philosophical profundity of Herbert Spencer. We have read his writings with confused amazement at the impressions they have made upon our mind, not knowing whether to doubt our own ability to grasp truly great and philosophical ideas, or to believe the scientific world to be most outrageously humbugged and hoodwinked in believing Spencer to be a truly great philosopher. For our own part we could not, with the utmost concentration of mental power, see from his pen one law or principle of science, or one generalization or particularization of philosophy that might not have been uttered in half the number of words, and thus have conveyed the gist of the idea (where there was any gist) much better. As a rule we were forced to regard his ideas as but average platitudes immensely elaborated and clothed, so as to cover up their common-place defects. There is frequently, as we firmly believe, more concise, clean-cut philosophical sense contained in a single page-article by one of our *MICROCOSM* contributors than can be found in any dozen pages of the *First Principles*, or any other work of Spencer's that we have read.

Although this has been our candid estimate of that much-vaunted and venerated philosopher for years, we have hardly dared to express the opinion in writing lest the defect might be in us, and, as before stated, in our own want of mental capacity to grasp such great and uncommon philosophical conceptions. But we are glad that another, whom our readers have learned to appreciate and honor—Isaac Hoffer, Esq.—takes the same view of Spencer and his lauded writings that has forced itself upon our mind, as will be seen by his able paper at the commencement of this number.

DR. VAN DYKE'S AND COL. PATTON'S BOOKS.

We have now a full supply of *Through the Prison to the Throne*, by Dr. Van Dyke, and *Death of Death*, by Col. Patton, our able and valued contributors. These two books are very favorably received by those who have read them, and are pronounced valuable accessions to any family library. They will be sent at \$1 each, or with a selection of other books (as in case of a Life-Subscription order), we will send them at the wholesale price, 75 cents each. Either of these books, or *Walks and Words*, *Retribution*, or *Universalism Against Itself*, will now be sent as a premium for two new

subscribers to the present (*third*) volume of *THE MICROCOSM*, with the money, \$2. For three new subscribers, \$3, the *Problem of Human Life*, cloth; and for four new subscribers, \$4, the *Problem*, leather, or *THE MICROCOSM* bound in cloth, vols. 1 and 2. This offer is only good till the close of the present volume, and for the complete vol. from August. Who will try for two, three, or four new subscribers?

OUR LIFE-SUBSCRIPTIONS.

Many of our subscribers are taking advantage of our liberal life-subscription offer, and are sending in their orders for \$15 worth of our books at wholesale price, as proposed. Several agents are making it a business to get life-certificates and then sell them to friends for what they will fetch, thus making a good profit besides that on the books. Quite a number of agents have already secured as many as five or six certificates each. A person thus armed with a life-certificate need have no fear of the season for renewals, which comes once a year, and which will now soon again be at hand, as there are only two more numbers of this volume to be issued, when all true friends of *THE MICROCOSM* will send on their \$1. The best feature of this life-offer is the fact that the certificate costs nothing, the books themselves paying a good profit on the investment. Or to put it the way Prof. Schell did last month—the certificate is worth the \$15, so the life-subscriber gets the books for nothing! Either way will suit us, so the books are only put into circulation and the seed thus sown for a rousing future crop. See wholesale prices of books on last page of cover. The \$15 worth of books will be sent C. O. D., if preferred, on receipt of \$2 of the amount in advance. Every Life-Subscriber, so far as heard from, is much pleased with the certificate.

Address HALL & Co., 23 Park Row, N. Y.

REV. DR. TEFFT AND PROF. STONE.

Our readers will remember that we printed in last September's number of *THE MICROCOSM* the substance of a criticism upon the *Problem of Human Life*, by Prof. Stone, of Colorado Springs, and a reply to the same by the Rev. B. F. Tefft, D.D., of East Poland, Me., which appeared originally in *Zion's Herald*, Boston. That reply has called out the most flattering commendations from our readers on account of its evidence of broad erudition and solid, outspoken good sense. After several months, it seems, Prof. Stone succeeded in mustering the requisite courage to answer Dr. Tefft in another paper in *Zion's Herald*, and in which he deemed it judicious to let us and the "Problem" quite alone, devoting his chief attention to neutralizing his reviewer's palpable hits. But this last effort has proved another failure, as the final telling rejoinder of Dr. Tefft makes apparent, and which we will print next month, not having room for it in the present number. We are proud thus to recognize as our friend, and as a well-wisher of our imperfect labors in the cause of science and religion, this acknowledged foremost scholar and thinker in the State of Maine.

EXPRESS CHARGES ON BOOKS.

Those who order books, or a single book, would do well to name the nearest express office, as it costs for a book only the same to prepay by express as for postage, and it is entirely safe from loss or damage and at our risk. We are constantly receiving complaints of books being lost by mail.

We believe they are stolen by dishonest mail-handlers in transit. Persons ordering from the Pacific slope (where it costs too much by express) would secure perfect safety by sending 10 cents extra for registering any parcel under four pounds. Think of these things.

TWO ARTICLES ON "CONSCIENCE."

We take pleasure in calling the attention of our readers to the coincidence of the two articles which we print in this number on the same subject—that of *Conscience*—from our two new contributors, one a distinguished divine, the Rev. Dr. Smith, of Bangor, Maine; and the other a distinguished lecturer and elocutionist—Mrs. M. S. Organ (*Lenore Le Jeune*) of Newburg, N. Y. We refer to these two articles as a kind of incidental test-case of the intellectual style, at least of an educated gentleman and an equally educated lady in handling the same religio-philosophical theme. 'Tis true the Doctor's argument is not complete, as his paper was sufficient for two numbers of *THE MICROCOSM*; but his style and logical powers are fully shown, and our readers, after a critical perusal, will decide for themselves on the general merits of the two papers and vote accordingly. As this is the first lady-lieutenant we have had to volunteer in the substantialist crusade, we are sure that our readers on that side of the house will feel proud to be represented by one so entirely competent to do them credit. May her finished pen never tire in defense of Substantialism.

THAT BIRTHDAY BUSINESS AGAIN.

CARD FROM PROF. GOODRICH.

Friends of THE MICROCOSM:

It was the original plan of Eld. Mullis, in proposing, in the March *MICROCOSM*, the scheme for a birthday present for Dr. Hall, that the amount should be limited from ten to twenty-five cents, so that all should be able to take part in the pleasant affair without making it onerous on any. Several have inclosed larger sums, and have urged a change making the limit \$1. This cannot be done, as it would prevent many from taking part who might not be able to spare more than twenty-five cents, or even more than ten cents. Some of the friends of the Editor are letting their enthusiasm take even a still different departure from the programme by sending valuable articles of use to serve as keepsakes, notably among which is an order from David Lubin, Esq., merchant, of Sacramento, Cal., on Dunlap & Co., hatters, New York, for the best \$10 silk hat in their store, which we have had the pleasure of placing on the Editor's head, to get the fit, and which he will first wear on the memorable 18th of August next. I take the liberty of recording in advance the Editor's thanks, as well as my own, for these marked expressions of good will toward *THE MICROCOSM*.

JOSEPH GOODRICH.

REV. DR. BAILEY'S PROPOSITION.

The suggestion made to our readers last month by the Rev. Dr. Bailey, that we get up a pamphlet on *Substantialism* for general circulation and home missionary work, has been kindly received by many of our readers who have pledged themselves to take from ten to twenty copies each, to sell, if possible, at cost (ten cents), or to loan where persons are willing to read, but not able or willing to buy. But these pledges are not plentiful enough yet to begin to justify the large outlay of getting up such a work. It will cost to set

the type and electrotype the seventy-two pages alone, \$200 to about \$250. Hence, we need not less than 1,000 persons to agree to take ten copies each (\$1 worth) before we dare risk this expense. Let each subscriber, therefore, who ever expects to do anything in this world for the missionary cause, get a postal card and before laying down this magazine write the following:—"Please put me down for ten copies (\$1 worth) of the proposed pamphlet on *Substantialism* as soon as ready"—and then mail the card to us. If any are disposed to increase the number of copies, it will only make the enterprise the more certain to go through successfully. The Rev. Elias Macy, Eldora, Iowa, writes: "I see you talk of issuing a pamphlet on *Substantialism* to aid in missionary work. You can put me down for fifty copies, as I intend to canvass our county this summer, not to make money but to do good. I may increase my order to 100 copies. Your sincere friend—Elias Macy."

We ask no one to take that many; but take all you can. If we shall get orders for 10,000 copies at ten cents each it will just cover cost, as the postage alone will be \$300. A single dollar thus spent will scarcely be felt by any subscriber, while he will be depositing many times that amount in the bank of heaven.

HALL & Co., Pubs.

POISON AND ANTIDOTE.

Some of our readers have urged upon our attention the fact that the Calvinistic teaching of Mr. Williston is theological *poison*, and that it ought to be accompanied with the opposite doctrine as an antidote in every number containing one of his articles. Well, if his teaching of outright Calvinism in its most undiluted sense (as in this number) is *poison*, then we have the antidote in Col. Patton's Free Agency and Foreknowledge article placed right beside it, and liberal enough, in all conscience, to satisfy even a reasonable Universalist. If, on the contrary, the Colonel's treatise should be regarded as theological *poison*, as it will be, no doubt, by some, then immediately following it is the orthodox plaster of Dr. Williston, broad enough and adhesive enough to cover the liberal blister. Thus *THE MICROCOSM* gives all sides of the vexed discussion, that our readers, who pay their money, may take their choice. Dr. Williston has one more of his adhesive arguments to present, when it will be Prof. Kephart's turn to reconcile the whole question with Scripture and reason, as he claims to be able to do, by striking a happy mean between the extremes of Calvinism and Restorationism. His article will appear in the July number, and possibly we shall have also a broadside from the Rev. Dr. McCabe himself. If he puts his force into it, which he will if he writes at all, we shall expect to see something give way. Let none of these articles be more than two solid pages of *THE MICROCOSM*. Generally we desire contributions to be only from one page to a page and a half long. Our own articles are of course exceptional, as there is but one Editor, while there are more than fifty contributors,

DATES OF SUBSCRIPTIONS.

All new subscribers must begin either with the first number of the volume (August) or with the half-volume (February). Any odd numbers between these two dates can be had by remitting 10 cents each. The subscription price is invariably \$1 a year. An agent who spends some time in the work of procuring new subscribers, can retain 25 cents out of each subscription for his trouble, sending us 75 cents. For three subscriptions (\$3) either of the following books will

be sent as a premium:—*Walks and Words of Jesus; Universalism Against Itself; Retribution; Death of Death; Through the Prison to the Throne*, or one volume of *MICROCOSM* (serial). For four subscriptions (\$4), cloth *Problem of Human Life*. For five subscriptions, (\$5). Leather *Problem*, or volumes 1 and 2 *MICROCOSM*, bound together. All new subscribers who desire it are entitled to the Editor's picture.

HALL & Co.,

Publishers.

G. VOGELSEANG ON WILFORD HALL.

The above named individual, of San Marcos, Texas, has issued a formidable circular headed—"Wilford Hall—How are the Mighty Fallen!"—which he has sent, as we learn, to all, or at least many, of our contributors, and in which he makes complaint that we refuse to publish his communications to *THE MICROCOSM*. We plead guilty. In the midst of scores of contributions which come to us through the mails from all parts of the country, we have only time to glance over them first, to assort them and label them under proper heads for future examination. If any paper shows "cranky" proclivities on its face, or such manifest literary defects as to require its reconstruction, we are obliged to reject it for want of time to revise it, as we have more papers than we can print, and which need no revision. Such a sentence, for example, as this, which we clip from the circular,—"If Hall had consulted the Bible he would not have wrote," etc., is enough to condemn an article to the waste-basket with nine-tenths of the editors in America. He says, further along in his circular: "We used to be an infidel on account of *too much learning*!" His first paragraph is a fair specimen of his "learning" and of his coherency of style:

"Wilford Hall, the great phenomenon in the modern literary world, the successful refuter of Newton's Principia, of the wave theory of sound, and Darwin's and others evolution theories, has come to a sudden stop in his progress in enlightening the world. Hall has a task in this *celestial* drama, but when he goes beyond this, his genius will not assist him, and consequently he acts as many other foolish human beings, when venturing on the cause of spiritualism, earthquakes, dowsing, the entities of heat or cold, and other questions of science."

Then it turns out that this fall of the "mighty," which constitutes the burden of his refrain, means simply that we are wrong on cold as an entity, and that our demonstrations in *THE MICROCOSM* are false. Those who have read the discussion on that subject can place the proper estimate upon this prodigious circular of Voglesang.

PROF. GOODENOW ON ELASTICITY

Next month we will print a very critical reply by Prof. Goodenow to our March editorial on the subject, as he heads it, of "Inertia and Elastic Force." What a pity he had not waited to see our article in this number before penning his paper. We wrote to him notifying him of its character. Had he seen it he certainly would never have written as he has, if at all, unless to acknowledge that the text-books on the subject have totally broken down. We commend the professor to study carefully the new laws, principles and discoveries herein developed, and thus be prepared for what we will say in reply to his paper next month.

THE "COLD" DISCUSSION.

We have received numerous letters from our contributors and most thoughtful scientific readers, fully, and even enthusiastically, indorsing our analysis of the cold-and-heat problem last month. Many regret the amount of space it was necessary to consume, but agree that as it had to be done, it were well that it was done thoroughly, so that the question should stay settled for all time. In reviewing that article, we are unable to see how it could have been made shorter, nor do we see any improvement we can now suggest in the conciseness or conclusiveness of the general argument.

BOUND VOLUMES OF MICROCOSM.

There are several thousands of our subscribers who have never read the first and second volumes of this magazine. Those volumes are full of the best thoughts of our contributors as well as of the Editor on a host of religio-scientific subjects. We have those two volumes bound in one book, with Editor's steel portrait, forming a massive work of between 700 and 800 pages the same as these, making a most useful addition to any thinking man's library. A copy of these two volumes will be sent prepaid by express for \$2, or with a selection of other books (not prepaid) at wholesale price, \$1.25. See wholesale price, on last page of cover.

HALL & Co., Publisher

TO THE COLLEGES AND SCHOOLS.

The next number of *THE MICROCOSM* (June) will be the last *free* number sent to the reading rooms, as the college year closes with most institutions before the July issue is sent off. Should any college or school, however, desire the July number, and write for it, it will be sent free. After this year, we trust that managements of educational institutions who wish to be up to the times in progressive scientific discussions, will subscribe for this Magazine (\$1), and place it in their reading rooms for the benefit of both pupils and teachers. Students, leaving school, would do well to remember *THE MICROCOSM*, and have the next volume sent to their respective homes. A club of three subscribers (\$3) will secure the fourth volume free, while the purchase of \$15 worth of our books at wholesale price, secures *THE MICROCOSM free for life*. This is an extraordinary offer. Send for special circular.

THOMAS MUNNELL vs. THE STANDARD.

We invite special attention to the reply of Eld. Thomas Munnell, to the criticism of the *Christian Standard*, particularly the latter portion of it, which gives a more detailed explanation of the Substantial Philosophy, as relates to the forces of Nature in their various manifested forms than anything yet written. The same general view is presented in our treatise on Substantialism in the *Christian Quarterly Review*, but the peculiar objections of the *Standard* critic have fortunately led to this more minute explanation of the difficulties involved in the premises.

CONTRIBUTIONS CROWDED OVER.

As has so often occurred, important papers of our contributors, as well as leading editorials, are crowded over for want of room. Next month will make several amends, and will give a better number of *THE MICROCOSM* than has yet been issued.

WILFORD'S MICROCOSM.

Vol. III.—No. 11.

NEW YORK, JUNE, 1884.

{ One Dollar a Year.
Single Copy 10 Cts.

A KIND LETTER MERCIFULLY CRITICISED.

BY REV. J. I. SWANDER, A. M.

The writer of this article is continually having his teeth put on edge by the acidity of the wild grapes which the editor of this magazine is charged with having eaten. Whether the grapes are too sour or the enamel of the teeth too thin is a question that has nothing whatever to do with the injustice and cruelty of the treatment against which we here ask permission to file our most solemn complaint and protest. That every one should answer for his own transgressions was a ruling of the Supreme Court under the dispensation of law; and under the Gospel the same ruling continues in force, except when the substitute volunteers his vicarious suffering. For our part, we are not willing to undertake the task and undergo the torture of any such vicarious atonement. Our reasons for such unwillingness may possibly appear in the following paragraphs of this paper.

Since the MICROCOSM entered upon its third volume we have received quite a number of significant communications touching the startling philosophy of Substantialism. These letters are written by many men of many minds, and bear post-marks from different points of the compass. The Rocky Mountains sent us greetings in our recent ramblings through the orange groves of Florida; and some of the wise men from the East have informed us that they have caught a glimpse of the ascendant star which is now attracting such general attention, and which promises to become the most central and luminous orb in all the constellations of the scientific zodiac. The letters differ very much in their most manifest spirit and purpose. Some of them are evidently written with a sincere desire to know the truth, and a willingness to follow its leadings through evil as well as good report. Others are just as evidently indited in that peculiar spirit of pharisaic "respectability" which is now the principal obstacle in the way of a more general advance along the entire line of the world's intellectual progress. One correspondent wishes to know the age of Dr. Hall, and whether the great Substantialist bids fair to live another decade of mental strength and usefulness. Another anxious-doubting Thomas seems to think that the writer of this article has a commanding influence over affairs at 23 Park Row, and asks us to set Wilford right on certain points in theology. He writes upon the supposition that the Editor will hear us, while he refuses to hear Moses and the prophets of a fixed and finished orthodoxy. One letter is so filled with the piety of its perpendicular pronoun as to go into epistolary fits over the unpardonable heresy of materializing Deity. Another correspondent informs us that he has "not read Hall's writings," but learns through the best authority at Vanderbilt University that the Substantial Philosophy has no foundation in truth. Now, we do not object to holding correspondence with scholarly gentlemen who are anxious to keep abreast with the rapid progress of the age, and willing to inform themselves concerning the most important scientific discovery of the 19th century; but our

impatience rises to a point of order when men who are "willingly ignorant" of *published facts* make merit of echoing the hollow hootings of blind owls. Besides, we take this method of informing all whom it may concern that we are neither the creator of Wilford's thoughts nor the custodian of his conscience.

Under one view, we are glad that thinking men are prompted to write such communications as some of those alluded to in the foregoing paragraph. They indicate an awakening interest in scientific questions. It matters but little whether these gentlemen admit or deny the startling claims of the New Philosophy; such inquiries show that the light shineth in darkness, although in some cases the darkness comprehendeth it not. Substantialism both merits and invites candid and intelligent criticism. The counter-shuttle is essential in webbing out the more excellent tapestries of symmetrical truth. Let the case be thoroughly examined, and the verdict rendered in justice untempered with mercy. All we ask—and what we propose to insist upon—is an impartial trial before a full and competent bench in open court—no star-chamber proceedings. The only court-room yet thrown open and offered to all parties is THE MICROCOSM. Of course there is not room in its columns for all the jargonic utterances of ignorance and prejudice, but candor and intelligence are cordially invited to speak through this *Leading American Journal of Science*. Come, brethren: Here bring your wounded pride: here tell your anguish.

Among these letters there is one which we deem worthy of special attention. It is from a gentleman whose pen is known to do but very little spluttering; a man of quite versatile scholarship; an acknowledged mathematician; a professor of theology, and no slouch in any department of literature or science. His communication indicates both a kindly disposition and incipient leaning toward The Substantial Philosophy. He regards Dr. Hall one of the first physicists of the age, and says that the theology of the MICROCOSM is "decidedly better than most of the current theology of the day." There is only one thing in the letter which we regard as very severe. Speaking of Hall's critics, he regrets that certain professors, after entering with such apparent gallantry into the great substantial controversy, should dodge the solid shot of Wilford's "finishing demonstration," and play the pitiable paltroof "by creeping into their little holes." While admiring the candor of our correspondent, and agreeing with him in the general drift of his schooled thoughts, we must, with all due deference for his superior ability, beg leave respectfully to differ from him on each of the three following points brought forward in his very amiable and complimentary communication:

1. Our able correspondent says of Substantialism: "There are some points of agreement with Spinoza, and his universal substance. Hall must take care that he does not run into some form of pantheism." Some points of agreement! Granted. What then? Shall we continue in the sin of materialism that something supposed to have a slight resemblance to pantheism may not abound? God forbid! Let cowards to the rear, and courage to the front! There are some points

of similarity or agreement between a horse and a mule; yet a horse is not always a vain thing for safety. Much depends upon the handling of the animal. Let those who despise the horse from fear of being kicked by the mule move back upon their rickety vehicle of molecular motion. The mule is the product of false union—a blending of what God had ordained to be kept distinct—the effect of an unlawful attempt on the part of theistic evolution to elevate a jackass into the superior status of the horse. Just so with pantheism in its relation to that system of truth recently discovered and known as the Substantial Philosophy. No true philosopher can object to the doctrine of universal substance until the substance of the Creator is proclaimed to be identical with the substance of the creature, thus making God and the universe consubstantially one. This latter, as we apprehend it, is pantheism, and the very marrow in the Spinozaen bone of contention. And yet Spinoza was nearer the truth than some modern philosophers who are continually putting asunder what God has joined together. It is quite probable that Spinoza sought to correct that old heresy of dualism which had been hatched from the false conception of two primordial principles—mind and matter—in eternal conflict. Intent upon such reconciliation, and unmindful of danger in the opposite direction, he fell into the vortex of pantheism. This is just what Wilford Hall cannot do without violating all the laws of consistency and rules of logic. If there is any danger it is in the direction of dualism, and its imminence is not yet very apparent. While he recognizes the dual structure of man as the microcosm of Nature, and distinguishes between the corporeal and incorporeal entities of the universe, he is both conscientious and consistent in proclaiming the *one* personal God as the fountain of all, over all, in all, and yet distinct from all. If this is pantheism, we propose to “run into” it as far as our holiest ambition will permit us to go; and still we expect to keep close company with the most biblical Christians of all ages. But it is not pantheism, and those who are trying to kindle their censorial fires to burn *such* heretics had better save their fuel and make a little effort to thaw the alarming frigidity out of their own theological dormitories.

2. “In some respects it seems to me that Hall’s philosophy is greatly alike to that of Swedenborg’s.” In noticing the above observation of our worthy correspondent, it is not necessary that we should either affirm or deny the soundness of the Swedenborg philosophy—if he, indeed, ever taught anything sufficiently distinct, clear and complete to be known and classed among the philosophical systems of the world. Few people have understood Swedenborg. The writer takes off his hat, partially out of reverence for the great celestial rambler, but principally to permit that necessary expansion of the cerebrum actually required for the comprehension of such “mystical lore.” Swedenborg seems to have been a “personal paradox,” and his writings an insoluble riddle. That they contain some great pioneer truths for the ages to come has not been denied by men who have the courage to examine all things and hold fast that which is good. John Wesley, Emerson and Carlyle were only a few of the many who looked upon him as “one of the mastodons of literature,” and his mind “majestic, though in ruins.” How rich the veins of his original thought, and yet how apocryphal are all his writings. If the Baron’s New Jerusalem Church is the one that “cometh down from God out of heaven,” St. John’s description of the descending bride contains more flattery than truth.

Swedenborgianism, with its dreams and prophecies, its revelations and speculations, its strained analogies and abominable absurdities is a—dead lion; and he proves himself a man of Samsonian powers who takes the mellific nectar of truth from such a hive. The Substantial Philosophy is something superior to this heterologous budget of riotous assertions and beautiful theories. Instead of being what Swedenborg taught, Substantialism is just what he needed to guide the sublime flights of his erratic soul and ethereal piety; and, further, it is precisely what some of its self-important and superficial critics need to distinguish between the verities of God and the vagaries of men. Indeed, many of the objections raised against the new departure savor largely of the most supreme childishness. We are about tired hearing the cry of “spooks in the garret.” For our part, if there were no other alternative, we would sooner harbor a few small spooks in our intellectual attic than to have the upper story destitute of all positive contents, and damned with that “respectable” sort of cowardice which prevents all earnest search after something more substantial than spooks, more entitative than shadow, more noble than mere matter, and more enduring than the flashings and flickerings of molecular motion.

3. Our correspondent says further: “Dr. Hall is an old man, and, before it is too late, should take time to write a systematic outline of the substantial philosophy.” Yes, he is 64 years of age, and we presume that he is reckoned an old man upon the principle announced by the poet:

“Virtue, not rolling suns, the mind matures.”

From this standpoint there is no visible reason why his name should go upon the superannuated list for nearly another score of years to come. Substantialism will enable a man to live longer than any other system of philosophy ever embraced. Length of days is in her right hand, and her left hand is beginning to grasp true riches and honor. The consciousness of being an organic entity, independent of matter, renews the youthful vigor of the immortal mind, and brings back the shadow upon the sun-dial of terrestrial existence. Besides, Providence seems to have appointed the 19th century to “give the old man a chance.” What a galaxy of venerable stars appear in this significant watch of time’s dark night. At 73 Blucher turned the tide of Waterloo; in his 81st year Dr. J. Williamson Nevin retains, in good degree, the powers of his vigorous intellect; at 70 Bismarck is without a peer in the broad, bright circle of the world’s diplomacy; approaching his 80th year, Bancroft writes the history of time’s most flourishing republic; in his 81st year Gladstone continues to manage a kingdom whose geography knows no setting sun; at 87 King William sways the sceptre over the world’s greatest empire with an arm unpalsied with age; and it is not unreasonable to hope that Dr. Hall will continue, by reason of strength and the blessing of Providence, to increase in power and usefulness until the 20th century of the Christian era shall mingle its dawning rays with the luminous flashes of his electric pen.

But what if the master-wheel of the new philosophy should soon be broken at the cistern? Would it, therefore, logically follow that the cistern is dry? By no means. Wilford Hall may be a “wheel,” a “pitcher,” or even a “golden bowl,” but he is not the *Fountain* of truth. The Substantial Philosophy has an objective existence of its own. Otherwise it would deserve to perish forever from the earth. Let no enemy of the truth lay the flattering unction to his soul that

this new movement in science hangs by the "silver cord" of any man's individual being. Substantialism will never want for advocates through which to challenge the consideration of men, nor channels in which its blessings shall continue to flow to the sons of men. Its builder and maker is God; and its first mission is to rattle up the dry bones in the charnel valley of materialistic scholasticism, and either regenerate many of its fossil theories, or cause them to appear as very present helplessness in time of need.

Let the good work go on to perfection. While this new and distinct system is sound in its basic principle, and beautiful in its fundamental features, it does not claim to have already attained, neither to be already perfect. Organic perfection in the finite sphere of being, consists largely in perfectability. No one knows this better than our intelligent correspondent; and no one has acknowledged it more frankly than Dr. Hall. Hence it is premature and unreasonable to ask him "to write a systematic outline" of that which is now only in the formative period of its history. The founder of Substantialism, like the Great Teacher sent from God, will doubtless finish the work which God has given him to do. We hope that when that work is accomplished he will have the good sense to die and go to his reward. Some Apollos will be called to water what Paul will have planted. This will take place in accordance with the ordinations of God. Time is an essential factor in the historic evolution of Heaven's grand designs. Even if it were otherwise, life is too short for any man to become both the author and finisher of a radical scientific faith. We hope and pray that the founder of the Substantial Philosophy may not be called to cross over Jordan until he shall have shown its strength to this generation and its power to every one that is to come. Should it be ordered otherwise, and in any event, the work will fall into other hands. Elijah's mantle may be a little broad across the shoulders for the forthcoming Elishas, but the young prophets will gradually expand their intellectual chests to that degree of fullness required by the size of the mantle and the responsibility of the work. In the meantime let the proclamation go forth throughout the land and unto all the inhabitants thereof, that Dr. Hall has written enough to convince all reasonable minds that a new scientific day has dawned upon the world; and that the morning is too far spent to prove the existence of the sun by candle light. Let students of philosophy read the *Problem of Human Life*, and study the editorials of the *Microcosm*, especially those in the April, May and June numbers of Vol. III., on *The Substantial Philosophy*. If, after following the above advice, they should still conclude that there is no original, clear and distinct undercurrent of radical truth in such lucid and logical writings, they would not be convinced though one should arise from the dead and announce the veritable existence of materialism's most unscientific hell.

THE GREAT PROBLEM SOLVED.

BY DR. C. H. BALSBAUGH.

We have stronger and ampler evidence that God made the worlds, and that Jesus Christ was God, than that "Wilford" wrote "The Problem of Human Life." Nothing is more scientific than the Bible, and no stronger proofs of this can be

found than in the results which are claimed by scientists to demonstrate the Divine nonexistence. It is *Mind* that scientists find everywhere, and *One Mind*. A Universe without a Unifier is as unscientific as a sensate organism without life. Without God the Universe cannot be, any more than we without life. He is "the Fountain of Life," and Jesus Christ is "the brightness of His glory, and the express image of His Person." Here the very language is scientific, and the fact pre-eminently so. The scientists are evermore telling us, "lo, here is Christ, and lo, there," only they are hiding the truth under the verbiage of unbelief.

God is, or nought is, and He is good, and His ways are right. This is self-evident, but we are "slow of heart to believe." Malign Omnipotence is foreign to scientific disclosures. Every time we despond we are depreciating God. We may procure suffering to ourselves, but this were impossible, did not God put His eternal, inflexible righteousness into the economy we violate. We thrust our hand into the fire, and the penalty is pain. The act and suffering are ours, but the burning is God's. So with every other law, physical and spiritual. We may take sick and die of avoidable or unavoidable causes, but God is in the cause and result, and He is no respecter of persons.

The Eternal Father and Co-eternal Son are of one mind. "He that hath seen Me hath seen the Father." "Let *this* mind be in you which was also in Christ Jesus." John 14: 9, 10. Philipp. 2: 5. This is the solution of the Problem of problems. But for this revelation, "Wilford's unparalleled book would never, and could never, have been written. Christ taught us vast and momentous lessons in the wilderness, as He did everywhere and in everything else. The devil's "if," is Haeckel's, and Huxley's, and the "if" of all atheistic scientists. Even Rev. Dr. McCosh hardly knows how to keep Emmanuel clear of Darwinian monkeyism. In the three great temptations of Incarnate Deity all ours are included. The trials of all souls from Adam till now and to the end of time, were pressed into those forty days of conflict with the world, the flesh, and the devil. To "condemn sin in the flesh," and "to walk as He walked," is our practical problem. "To know Christ passeth knowledge." This knowing is the supreme purpose of the Incarnation. All other knowing is but eating of the forbidden tree, and bringing upon ourselves damnation to the uttermost. We have no right wasting our spiritual power in serving the flesh. Had Christ exercised His divine prerogative to satisfy his hunger by turning stones into bread, He would have forfeited His Sonship. We dare not resort to questionable means to extricate ourselves from trials which God sends for our discipline and sanctification. A forty-day's fast may wonderfully open the mind of God to us, and bring in a mighty accession of spiritual light and strength. There are many forms of fasting, but only one way. All fasts mean abstinence from some pressing claim. Christ's greatest fast was on the Cross when He cried out in bitterness of soul, "Eloi, Eloi, lama sabachthani." He hungered for God, but fasted patiently till the Father unveiled His face, and solaced the dying Godman with His Paternal recognition. Here is a sublime and inspiring example for all the saints. How often we forget it? We must believe in and honor and glorify God when the sun shines; then we may also trust and hope and rejoice when the darkness comes. Those who live as they

list in health and prosperity, will be sure to be overwhelmed with fear and horror and despair in the day or adversity. "God is not mocked." The sowing and the reaping correspond. The sowing and the gathering are ours, but the law of the harvest is His. The flesh belongs to God as well as the spirit, but we are not to sow to it but till it for the seed of the Holy Ghost. "Ye are not your own, ye are bought with a price; therefore glorify God in your body, and in your spirit, which are God's. 1 Cor. 6:19, 20. This is the very pith of science, and the very essence of salvation. God made a *universe*, and one great law holds it together. The Man Christ Jesus is the only begotten of the Eternal God, the unbeginning Word, the incorruptible Seed, and He was sown by the Holy Ghost into the soil of Humanity, and behold the product! Did scientists ever discover and announce anything more scientific? "As He is, so are we in this world." 1 John 4:17. More and more does it become evident that science and God are synonyms. We are Spirit-sown, and our flesh is no longer simply flesh, but the embodiment of Divinity. Christians are God-born, Christed, miniature Emmanuel. "Everything after its kind. This is the law of all that is, God included. This is science, for time and eternity.

God has a glorious end in view, and from this He never deviates. We may lose sight of it, and become despondent or debased, but in His infinite Wisdom and Power and Righteousness and Love all things work together for a grand consummation. "The high calling of God in Christ Jesus" is for the endless ages. By it we are moulded into the Divine likeness by means which seem very bitter to the carnal mind. It cannot be otherwise. Science will not allow it. God has undertaken in the Incarnation to undo the devil's work, and to restore us to our pristine dignity, and exalt us to the altitude of the Eternal purpose. It takes all our lifetime, and many meltings and emptyings and wrenchings, till we see how corrupt and self-centred we are. The more we see of Jesus, and in Him of the Father, the more does our sinfulness come into view and humble us into the dust. Is not this according to science? Our souls are under the laws of science, and they "cry out for God, for the living God." The aged Christian sees deeper into the spoliations of sin in his nature than when he was a babe in Christ. Only those who have kept close to Jesus for years know how to link together the amazing antipodes of Rom. 7:24, and 8:38, 39. The same soul uttered both. When we see and know little of Emmanuel, the flesh promises well, like the serpent in Eden. But when we advance in the knowledge of God, and get clearer views of and deeper acquaintance with the sanctifying mystery of the Incarnation, "the little foxes" will annoy us more than did formerly the lions and leopards. Cant. 2:15 and 4:8. When the beauty and purity of Incarnate Jehovah are not appreciated, the tender buds of the vineyard are not looked after nor thought of. What is born of the flesh is flesh, what is born of the Spirit is spirit. This is the great truth which science has so abundantly demonstrated, and yet is so reluctant to admit. Scientists have cut their own throats, and they will never live again till Christ gives them life.

O the pain, O the bliss, of dying into eternal life. Of this the Bible is full, and every Christian can heartily testify to its reality. The Christian's tears are ten thousand times sweeter than the worldling's wildest joys. The saint would not exchange his sighs for the longest, loudest laugh of the godless. The Holy Ghost begotten know Him

"who for the joy set before Him, endured the Cross, despising the shame, and is set down at the right hand of the throne of God." Heb. 12:2. Not a small matter is the Divine Incarnation, and not a light work is human redemption, either for Christ or for us. The Higher must come into the lower to utilize it, and the lower must die in order to live. Is not this science? "Through much tribulation we must enter into the Kingdom of Heaven." The lower does not push itself into the higher, but is lifted by what is above it. If we would know the awful depth and utter fatality of our fall, and the tremendous difficulty and pain of our recovery, we must read the astounding truth in the agonies and horrors of Gethsemane and Golgotha. God wants the whole of human nature. Less than this would not be salvation. This He could get only by becoming man Himself, and permeating every nerve, and atom, and drop of blood with Divinity. And this is His aim in every Christian. This is his high calling. To realize it is salvation. Christianity means the subjection of our entire personality to the dominion of the Holy Ghost, so that we may be "changed into the same image from glory to glory." This is the only life that God originates, owns, develops and perfects. "Because I live, ye shall live also." Do not scientists admit this law in the whole realm of matter? Why exclude it from the domain of Spirit? "To me to live is Christ." Is not the Nazarene Carpenter as historical as Cæsar, or Herod, or Alexander, or Homer? And do not the facts of His history as indubitably prove Him Emmanuel, as those of Herod do his devilism? "I live, yet not I, but CHRIST LIVETH IN ME." Is the proof of Christianity not as clear as Tyndall's scientific attainments? The great fact of to-day is Christ, very God, very Man.

"We shall see Him as He is and be like Him." Here is the single, rigid condition to this rapturous consummation: If we have this hope in Him, we purify ourselves even as He is pure. 1 John 3:3. This brings the peace of God which passeth all understanding, and keeps the heart and mind through Jesus Christ. Philippi. 4:7. Let us press this sweetest of all truths to our heart of hearts, as the balm of time and the ecstasy and glory of eternity.

UNION DEPOSIT, Pa.

GOD'S FOREKNOWLEDGE.—MAN'S FREE-WILL.

BY JUDGE G. C. LANPHERE.

To the Editor of The Microcosm:

Considerable has been said of late in your valuable paper on the subject of God's foreknowledge and the freedom of the will. Will you permit me to present a few thoughts on the subject?

Is foreknowledge in God inconsistent with man's freedom of will?

Suppose from my intimate acquaintance with an individual, I can form a pretty correct idea of what he will do in given circumstances; does that knowledge on my part affect or limit his freedom? This kind of knowledge is common, in a greater or less degree, to all great commanders and administrators of the affairs of men. It enables them to make a wise selection of the agents or instruments to carry out their purposes. The greater the knowledge of men, of human affairs, and of the natural laws, the more perfect will be one's forecast of human events. Now, suppose my knowledge is so extended or perfected, that I not only know, to some degree of certainty, the char-

acter of an individual, but the circumstances that will surround him at a given time; will that increased knowledge alter the case, or make him less free than he was before? Again, suppose my knowledge of the man and his future surroundings is made perfect, or *is* perfect, does a perfect knowledge on my part affect his liberty any more than the limited knowledge? If a little knowledge on my part leaves him free, how can perfect knowledge enslave him? In other words, what has my knowledge of a man's future conduct to do with the freedom of his will? and can it make any difference in its effects, whether this foreknowledge is possessed by a human being, or the Almighty? We may well assume that foreknowledge in man is the same in kind, though not in degree, of perfectness, as in God, and its effects must be the same. The foreknowledge is something outside of the individual or object, and independent of him. It is sometimes said that man cannot do different from what God foreknows he will do, and hence is not responsible for his acts. It is enough to say in answer, that a man does not *will* to do different. He does what he wills to do. How, then, does God's foreknowledge control his will? God's foreknowledge simply amounts to knowing that man *wills* to act in a certain manner.

I have been greatly surprised to see writers of learning, ability and religious instincts deny foreknowledge in God in order to maintain the freedom of the will. To my mind, they might as well deny the existence of God. If God is infinite, and we can scarcely conceive of a being capable of creating and sustaining the universe who is not, He must be infinite in all His attributes. His knowledge must be infinite. With such a being there can be no such thing as time. He is the "Eternal," which was, and is, and is to come. Strictly speaking, there can be no foreknowledge or afterknowledge with Him, but all is one eternal *now*. All events, infinite time, though separated by countless millions of years, are simultaneously present with Him.

GALESBURG, Ill.

THE SUBSTANTIAL PHILOSOPHY AND THE BIBLE.—NO. 3.

BY J. W. LOWBER, M.A., PH. D.

During even my college days I could not avoid skepticism in reference to the wave-theory of sound. The venerable professor tried to make it all plain, but I could not see it. I mourned over my stupidity, and sometimes thought that it might be best to give up the contest. My love for the study of the sciences, and, especially, their relation to religion, caused me to persevere in my begun course. When I had attained to the sublime degree of Doctor of Philosophy, I was terribly muddled. The tendency to reduce all the forces of nature to absolute nothingness, was, to my mind, against a sound philosophy. Besides all this, I could clearly see in it a skeptical tendency.

In the year 1880, when I was President of Columbia College, Kentucky, a copy of "The Problem of Human Life" was handed to me. As I then had an interesting class in natural philosophy, I studied the book with a great deal of interest. I not only found in it many things to strengthen my skepticism in regard to certain things taught in physical science, but I also found in it the basis of a new philosophy. A few days ago a friend said to me that THE MICROCOSM is tearing down the old theories of science without substituting anything new in their stead. I told

him that he was mistaken; that THE MICROCOSM does not claim to know everything about the great volume of nature; but that it does claim to know that the forces of nature are substantial, and that in this it agrees with Paul, who claimed that the unseen things were more substantial than the seen.

Dr. Hall has made his principal attack upon the wave-theory of sound, for if sound is admitted to be substantial, there will be no trouble about the other forces of nature. There is one thing, which is simply a matter of observation, that puzzled me from the time I commenced the study of philosophy until I abandoned the wave-theory of sound, and that is the rapidity with which sound will travel through a solid medium. If the wave-theory were true, sound would pass through a rare medium more rapidly than through a dense medium; for, according to that theory, it cannot get along without condensation and rarefaction. But to our utter astonishment, the more solid the medium the more rapidly is the sound transmitted. It travels through water four times as fast as through the air. The wave-theory will never survive the fact that sound travels through solid iron seventeen times faster than through the air. In the earlier part of my philosophical studies I thought that sound would travel more rapidly through the air than through iron; and if I was compelled to hold to the wave-theory, I would try to make some change in nature in that respect.

The Substantial Philosophy does not shrink from the rigid test of experiment. About two years ago I heard a college president say that Dr. Hall is a good reasoner, but not an original investigator in physical science. It will be well for that president to read Dr. Hall's "Finishing Demonstration," as printed in the October and December MICROCOSMS, 1883. We would be gratified to have some of these original investigators show wherein the Doctor is wrong, if indeed he is wrong; for many of us believe that his demonstration is conclusive, so far as the falsity of the wave-theory is concerned. Think of it: The velocity of sound in air is 1,120 feet per second; and without this rapidity there cannot, according to the wave-theory, be any sound. Dr. Hall has demonstrated, as confirmed by Captain Carter's experiments, that a tuning-fork will sound audibly when its prongs are moving through the air only at a velocity of one inch in two years, even at the middle or swiftest portion of each swing. That is, the prong must condense the air in front of it, if the wave-theory be true, driving off a sound-wave at a velocity of 1,120 feet a second when its own velocity is 25,000 times slower than the hour hand of a clock! Let original investigators disprove this if they can.

LOUISVILLE, Ky.

REV. DR. B. F. TEFET'S REPLY TO PROF. STONE.

[From Zion's Herald.]

So much time has elapsed between the publication of my little article on Hall's "Problem of Human Life" and Prof. Stone's late reply, that I had nearly forgotten our friendly tilt; and I am now so far from my usual home conveniences for writing, and so occupied with other things and thoughts, that an elaborate rejoinder to his second article, which I am glad to find more moderate in temper than the first, is now quite beyond my reach. I write in a Buffalo lawyer's office, in the midst of every style of talk, from easy conversation to a loud debate, where all self concentration is put to its severest test. A few hasty notes

are all that I can offer at the present : and I have the impression, somehow, that nothing very arduous is now wanting to my side in this model contest in the quest of truth.

The case is a very simple one; and I must not allow my learned opponent to conceal the real issue under a flood of words. The case is this: Some months ago, Prof. Stone published in *Zion's Herald* a very caustic criticism of Dr. Hall's production, which, as I thought, was injudicious and undeserved. Dr. Hall's work was a scientific defense of Christianity against a modern scientific system of speculation known as evolution. Its sale had been marvelous for such a work—in fact, phenomenal. In certain circles of great respectability it had been lauded as the grandest production of our time. Such eulogy somehow hurt the feelings of Prof. Stone; and he wrote his first article to show that the book in question was less worthy of admiration than contempt. On the contrary, my idea was that an honest defense of Christianity, be it ever so humble, should not be held up to ridicule, and that, in reality, the ridiculous side had been taken by the author of this attack; for I showed, I believe, that his positions were groundless, some of them evincing great want of information, the rest seeming to be absurd; and I sincerely wished him to look deeper into the matter between evolution and Christianity, hoping that, by so doing, he would eventually come out on the Christian side.

After waiting so long as to almost have lost sight of his first article, together with my answer to it, I find him coming forth again with a much longer, but milder and sweeter one, which, however, is not now an attack on Dr. Hall's famous book, but a sort of reconstruction of himself. But I think his second failure is quite equal to the first; and he becomes more and more obnoxious to criticism by the repetition of his original fault. He makes no withdrawal, no modification, of his original charges against the work of Dr. Hall, and he still holds, or seems to hold, that Dr. Hall deserved no thanks for his defense of the Christian religion against the destructive opposition of modern evolution.

Why not? Does the Professor utter one argument against the book itself? Not one. But the book has been too much lauded; and the writer of it should have said nothing in opposition to our modern materialism, because Christ and His apostles said nothing of the same material speculation when working at the foundations of the Christian Church.

Now, this was the main error of Prof. Stone's first communication; it is here again repeated in the second; its absurdity, its want of accuracy to fact, the showing it makes of the learned Professor's want of knowledge, or perception, or logical acumen when applied to religious subjects, should be pointed out; and I trust he will be candid enough to see that his skill in theology is about equal to what he considered mine to be in science. That is, he seems to have no conception of what the preaching of Christianity was in the hands of its divine Founder and His assistants. He thinks, he *says*, that they preached their doctrines over Judea without ever referring to the materialistic theories of the old philosophers of Rome and Greece.

Let us look a moment at this singular proposition, which constitutes the head and front of Prof. Stone's twice-told offending. Let us recall to mind the nature of this ancient material theory; for then a child can tell whether it was, as I hold, or was not, as held by Prof. Stone, preached against

by Jesus and His apostles. The Professor knows, or should have known, since it is a part of his proper scientific outfit to know, that all the ancient sages were of two opposing schools of science, the one claiming *matter* to be the only principle in nature, the other that the universe consists of *matter* ruled by *intellect*; and these two divided the world between them.

The Intellectual School was the older of the two. It is probably as old as the human race. It certainly is as old as history; but the man who gave it a scientific basis was Thales of Miletus, father of the Ionic sect of philosophers, who, in the same line, was followed by such illustrious characters as Anaxagoras, Socrates, Plato, Aristotle, Xenophon, and many others, whose theory was in full vigor at the birth of Christ. Pythagoras, too, founder of the Italic sect of philosophers, also taught the intellectual theory; and so it continued to be taught, on both sides, till the time of Democritus of Abdera, who, by the help of Leucippus, his leading disciple, began the vain struggle of accounting for all things solely on material principles. This, of course, was the Material School.

These ancient materialists declared, like their modern followers—Tyndall, Huxley, Helmholtz, Hæckel—that *matter* is all; that there is no such thing as intellect, or spirit, excepting as a quality of matter; and hence that such words as God, soul, immortality, are unmeaning terms, mere misconceptions of very shallow brains.

Will the learned Professor now claim that Jesus and His helpers took no sides in this vital controversy? Because Jesus nowhere calls Democritus, Leucippus, or any other materialist by name, are we to hold that He never preached against them? What did he preach? He preached that He himself was the Son of the ever-living God; that He came into the world to save the souls of its inhabitants from a certain *moral*, not *material*, condition known as that of *sin*; that this salvation was to be by a certain change wrought upon our *moral* and *intellectual* natures designated as a *spiritual* new-birth; that, in consequence of this spiritual reform, the subjects of it were to inherit a blissful *immortality*, a state recognized as "eternal life," and thus it was that every word He uttered, was a blow aimed at the material theory of the universe, and in direct advocacy of the moral and intellectual. What more, what less, has been done, in his own way and time, by Dr. Hall?

Dr. Hall, then, in the publication of his book, has been walking in the footsteps of Jesus Christ, thus meriting approbation rather than reproof. But the trouble with him is, that, in thus following his Master, he has found it in our day essential to call names. He has had to speak of the old-time materialism under its modern title of evolution; and in doing this, its living authors and abettors, together with their absurdities and self-contradictions, have fared very severely at his hands. No man on this continent has taken up the argument against him. He has dared his critics to the conflict. He has offered to pay them for their labor, and to publish what they write without expense to them. But not one of them, of any scientific standing, has ventured to face him in the field. He has sent copies of his work to the leading advocates of development in this country and in Europe. All he gets from them, here or anywhere, is half a line from Prof. Tyndall:—"I find the book to be infinitely amusing."

Professor Tyndall has found the work, indeed, to furnish him such a fund of mere amusement, that he cannot find an hour empty of this amazing fun to write a paragraph against it; and all we

hear from any quarter is, like the articles of Prof. Stone, such a clamorous but harmless outcry against the author of the book as to show, most emphatically, that their darling theory of evolution has received a mortal hit. My personal advice to the readers of *Zion's Herald* is to get the work and read it. They will then need no defense of it at my hands, nor care a copper for the round-about insinuations of even so scientific a gentleman as Prof. Stone.

But Prof. Stone has committed only the sin so common to his class. They all take the ground, especially when pushed for arguments, that those whose business requires them to pursue studies of a spiritual nature can know little or nothing of studies merely physical. They forget that the world has never been destitute of knowing both sides alike. From Aristotle all the way to Bacon, there were men at home on both sides of the dividing line, who equally comprehended the physical and the metaphysical, and who wrote equally well of both. There are just such men to-day; and I could mention clergymen of my acquaintance, who, I am quite certain, have read more largely in physical science than Prof. Stone himself. Such men laugh a certain little laugh—the Professor may guess what sort of laugh it is—when told, as Prof. Stone tells me, that they may have some knowledge “in the direction of the spiritual and philosophical,” but must consequently be deficient “in the domain of physical science.” That is, the study of theology weakens one for the study of other subjects.

Can language express the shallowness of this supposition? Did the Professor ever read Mansell or Coleridge or Roger Bacon? Did Bishop Butler know less of the “constitution and course of nature,” because of his being *primus inter pares* in theology? Besides, what is theology? Is it some section, some thin slice, of universal knowledge, like chemistry, or botany, or mineralogy? Nay, verily. Theology is the science of all sciences. Theology excludes nothing. All the sciences are included in it. Its subjects are God, man, and the material universe; its scope covers all space and time; it begins with the beginning of things and goes forward forever in equal step with eternity. It is physical science, on the contrary, that is sectional, partial, limited; and they who pursue it, as we see in the instance here before us, are the ones who show their deficiency the moment they get beyond their narrow borders. Prof. Stone is only a fair and honorable example of his brethren.

FACTS CONCERNING ACOUSTICS.

BY CAPT. R. KELSO CARTER.

It is well occasionally to review the ground passed over, and to see what forces have been employed. I desire briefly to summarize the facts developed by my experiments during the past two years.

1. In October, 1881, I had the honor of first performing the experiment (at the request of Dr. Hall) which demonstrated, beyond all dispute, that the fundamental law, “the intensity of sound varies inversely as the square of the distance,” has no existence, whatever in fact. The text-books say that four bells (or other sources of equal sound) will exactly equal the volume of sound from one bell at one-half the distance. My experiments proved that four pitch-pipes about equaled one, when the distance from the four was thirty odd times greater than the distance from the single pipe.

One equaled two at one-ninth of the distance, etc., etc. It is noticeable that no one who has undertaken to criticize THE MICROCOSM has dared even to mention this fundamental experiment. I cite it now with renewed emphasis. Let us take a syllogism:

1. Anything which radiates from a centre, in the shape of shells or spheres, *must* diminish in intensity, along any one line, as the inverse square of the distance.

2. The diminution of sound, along any one line, does not bear the remotest resemblance to this law. Therefore, sound does not radiate in the form of shells or spheres. Hence the wave-theory has not the shadow of foundation in fact. I invite Prof. Mayer to try this experiment, and see if it will give him the courage to answer a courteous query from a fellow teacher.

In March, April, and May of '82, I discussed at length the subject of resonant tubes. From repeated experiments, with new and improved apparatus, I deduced velocities for sound varying from 1,159 ft. per second, all the way down to the preposterous figure of 880; and showed that the deduction of 1,120 ft. by Prof. Tyndall was the result of a chapter of happy accidents bordering on the miraculous.

In June and July the subject of organ pipes was presented, with conclusive authorities. The organ builders freely testified against the acousticians, and even the workmen of Professors Mayer and Koenig deliberately contradicted the statements of their employers. Professor Mayer declares that the “length of organ pipes are inversely as the number of vibrations.” Messrs. Hook & Hastings, the renowned organ builders, say, “In our ordinary work the diameter decreases one-half itself at the 17th note, while the length decreases one half at the 12th note.” Koenig's organ-pipe sounding C⁴ wanted one-half inch of being one-half the length of C³, his work thus stultifying his words.

The special point was here raised,—if a tube is resonant because the sound-wave from the fork held over it is reflected back from the bottom of the tube, from what is the wave reflected when an open tube is used instead? There is no bottom to reflect the wave, but if the length be correct, the resonance is heard.

In August I performed the original experiment of testing two unison-forks at variously different temperatures, and showed conclusively that the wave-theory requires us to believe that a fork, which has been heated and thereby lengthened, actually vibrates slower than its cooler mate. Again the wave-theory declared a difference of thirteen vibrations between the two forks when at zero Cent. and at 130; whereas the audible beats distinctly said three.

In October, '82, I proved, by inserting a flat or curved card between the prongs of the fork, that the reason for the increase of sound, when one fork-prong is covered with a tube, is simply the added resonance of the tube. This subject of *Interference* proved quite fertile, and I was enabled to show from Prof. Mayer's own diagram and language, that he called a part of a circle or shell of sound a “rarefaction,” and the rest of the same shell, a “condensation,” while insisting that each “spreads all around the fork.”

The point of the rebound of the supposed air-wave in the “rarefaction,” being wholly due (if it existed) to the elasticity of the air, was here presented, emphasizing the fact that the condensation would necessarily have the rate of speed of the fork, and the rarefaction, the rate due to the elasticity of the medium. Further, I showed that

a push or condensation can not be said to stop anywhere in particular, whereas the wave-theory requires it to bolt and go backward continually.

In February, '83, I was so fortunate as to hear Mr. Distin play upon the tuba, and recorded his marvelous performance of one and a half octaves, accidentals, shakes, etc., *without touching a single valve*; as also his production of two, three, and even four notes *at the same time*. The wave-theory is absolutely helpless here.

In April, I had the pleasure to quote Prof. Tyndall in a recent lecture, as saying, "*Ether is a real entity, a substance endowed with inertia, and capable, in accordance with the established laws of motion, of imparting its thrill to other substances.*" The man who can imagine all space filled with so immaterial a "substance" as ether, which "is capable of transmitting its thrill to other substances," certainly never ought to stumble at the *Substantial Theory* of sound. Just here a new question arises. Can Prof. Tyndall explain just how the imponderable ether manages to strike against the comparatively weighty air, with force sufficient to "transmit its thrill?" He cautiously says that the ether has "inertia." How much has it? Will Prof. Tyndall go into the inertia calculation, and attempt to cipher out this problem?

After a short time I gave the first rational explanation of the fork and resonant tube ever published to the world, in the October number of THE MICROCOSM. I then attacked the Chladni plates and showed that if the wave-theory be true, there will be total silence along a line perpendicular to the plate at its centre. Before doing this, however, I was led to make the original discovery that "*when the ear is in the vibrating body (as the air) a single or semi-vibration produces the same effect as that produced by a double or complete vibration when the ear is not in the sounding body.*" At this time I made the report of the now famous experiment which proves a large fork to be moving at the rate of only *one inch in two years*, while still audibly sounding.

Lastly, in March and April, '84, I carried Dr. Hall's famous locust a little farther, and extended the argument to the celebrated experiment of the bell in lake Geneva. The special point of this last annihilating argument is the transference of the work of the locust or bell from the scale weight of the air or water to the inertia or dead resistance of the same. I cannot enforce too strongly the fact that the question of amplitude of vibration is thus entirely thrown out. We do not need to ask how far the first particles of air were moved, nor what was the thickness of the first "shell of air." The *facts* are that the air and water were actually shaken or moved (according to the wave-theory) by the locust or bell; that this motion had a certain *rate*, and that to this rate of motion the air or water must inevitably oppose a dead resistance, hundreds of times in a second, at least amounting to 78,000,000 tons in the case of the locust, and two trillion tons in the case of the bell. We have the locust, the bell, and the motion. When the locust tunes up, and the bell is struck, the motion begins. Whenever they stop, it ceases. Cause and effect, beyond the shadow of a question. But the cause is frightfully inadequate, therefore the theory is wrong. I invite the most searching scrutiny into these *facts*. If any weak point can be discovered anywhere, I will be exceedingly obliged to the discoverer, although I cannot promise to enter into any private correspondence on the subject. If any man can meet the first experiment here recorded, and escape from the crushing weight of the locust and bell, I will cheerfully resign the whole case. PA. MIL. ACAD.

EVOLUTION ONLY A HYPOTHESIS.—No. 2.

BY REV. J. J. SMITH, D. D.

In my former communications, after having called the attention of the reader to the necessity of keeping before the mind, in the investigation of this subject, the important distinction between *developement* and *evolution*, namely, that the former simply means progress in growth and improvement in individuals and types, as is seen in the unfolding of the oak from the acorn, the adult animal from his low embryonic condition, etc., and the improvement of species by fanciers and breeders by methodical selection and painstaking, etc.; while the latter means evolving *life* from *death*, or, which is the same thing, life from inorganic lifeless matter, and the transmutation of the species, I then proceeded to point out the insurmountable difficulty that meets the evolutionist at the very threshold of his theory, namely, how to get organization and life started from or out of inert matter.

I now propose to point out other difficulties equally fatal in the theory of evolution. One of these is the manifest want of that unity in structure and character among organic forms that this theory absolutely requires. And just here, and inseparably connected with this, they have another perplexity equally as formidable, namely, how to account for the most positive and unmistakable evidences of a most masterly intelligent designer, planner and artificer, that for wisdom immeasurably transcends the mightiest intellect on earth; for this wonderful mechanism could not possibly have come from blind, unintelligent atoms or molecules.

On the supposition that it were possible to get organization and life started without a Creator, then there would necessarily have been in the commencement, not only organization and life in their lowest and simplest possible forms, but there would have been necessarily from these alleged inherent laws of matter a specific oneness and unity in structure, nature and form; and especially so in the lower types. But this is not the case. Even in the earliest form of vegetable and animal life there exists between them an unaccountable and impassable gulf, which remains to the present day. For instance, plants are largely composed of carbon, animals of nitrogen. Plants develop from seeds; animals from ovaries, or eggs. Plants live on inorganic matter, animals on organized food; or in other words, the former manufacture, and the latter consume organic pabulum. Plants are without heads and perception; animals have both. Plants have no volition, but animals have. Plants consume carbon and give out oxygen, while animals consume oxygen and give out carbonic acid, etc. It is, therefore, evident that both of these, so widely different in all their essential characteristics could not have possibly resulted from a homogeneity of blind inherent properties of matter. Even to suppose that there might be a duality of nature in these alleged inherent properties of matter will by no means be sufficient to meet the case; for the same difficulty is met in accounting for the *widely different types* in each of the vegetable and animal kingdoms. For instance, in the latter, instead of specific unintelligent unity of structure without plan, we have no less than *five distinct intelligent plans of structure*; namely, vertebrates, articulates, molluscan, radiates and protozoans.

Now to account for these radically different and intelligent plans of structure on the theory of evolution is absolutely impossible, for, as before said, here is positive and unmistakable evidence of an

intelligent planner and builder of the most consummate wisdom and power. And, furthermore, this superior intelligence is seen throughout all the types and varieties, both in the vegetable and animal kingdoms, in their wonderful structures, ramifications, adaptations, combinations, and processes. In the animal division, we see more especially the marvelous and beneficial results attained, such as the senses of feeling, smelling, tasting, seeing and hearing; together with their surprising instincts. And then in man, in addition to all these, the still higher endowments, such as thought, judgment, reason, conscience, etc. Now, from where came all this intelligence? These wise plans, contrivances, adjustments to conditions and environments; the skillful interlacings and ramifications of nerves, arteries, veins, muscles, etc., etc.; the arrangements and guidance of material and psychological forces, so as to secure important and beneficial ends? Surely, not from inert inorganic matter; for its atoms or molecules are absolutely destitute of perception, or even motion; while all these animal forms bespeak an intelligence that is absolutely boundless.

Even granting what Herbert Spencer and other evolutionists absurdly claim, namely, that there is in matter an inherent "Persistence of Force," working by differentiation and integration, etc., it by no means solves the difficulty. These forces of which he speaks are only mechanical forces, and consequently, they are entirely inadequate to produce what we see everywhere around us. In mere force there can be neither good nor evil, and it would be far more likely to produce, if it could produce anything, monstrosities, than otherwise, or confusion instead of order. These manifest plans and purposes require something more than mechanical energy to meet the case. There is manifestly something in these productions vastly superior to mere mechanical force. It is perfectly absurd to think of evolving the conscious from the unconscious, thought from that which has not the first element of thought, and intellect and wisdom from that which has neither. The wisdom that is so wondrously displayed in all these different plans and forms of animal life, certainly did not so much as come from the animals themselves, because it is infinitely higher, and this wisdom even moulded and fashioned them. How passing strange it is that any one, making the least pretensions to a knowledge of philosophy and logic, should entirely lose sight of the axiom so well established, namely, that there can be no intelligent plan, design and skill, without an intelligent planner, designer, and artificer. The principles of causation in this case require that we go back to an adequate cause. There must necessarily stand back of and above nature an all-wise, and an all-powerful and beneficent organizer, moulding, controlling, and guiding his own ordained forces in the animal and vegetable kingdoms to their appointed destinations, and this Being we call God.

TARRYTOWN, N. Y.

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**GOD'S ETERNAL CERTAINTY IS NOT MAN'S
HELPLESS NECESSITY; OR THE OB-
JECTION THAT GOD'S FOREKNOW-
ING AN ACT RENDERS IT UNA-
VOIDABLE, PROVED FALSE.**

BY REV. T. WILLISTON, M. A.

OBJECTION V. "If absolute prescience be true, prayer becomes not only nonsense, but an inexcusable absurdity." In other words, if all things "are now infallibly foreknown, and certain and fixed," not only prayer, but means of whatever

kind are utterly useless, and he is more than a simpleton who attempts to use them. This false inference has been proved false scores of times, but like a counterfeit coin it keeps coming back. Let us see if it cannot now be nailed to the counter. The presenters of the above objection seem to forget—or else are morally too blind to see—that in the kingdoms of nature, providence, and grace, God employs means to execute His fixed designs, and that the end He aims at, or the event that is *certain to occur*, is not a whit more certain, than are the appointed means for the fulfilment of the aimed-at end. For example, when God, through Isaiah, said to King Hezekiah, "Set thine house in order, for thou shalt die, and not live," that announcement was a *conditional* one, and it was God's fixed purpose that Hezekiah should live fifteen years longer. Yet the prayer which Hezekiah then offered, and which was the means of his life's being prolonged, was just as really foreseen and pre-determined as was the addition of fifteen years to the king's life. Again, it was God's fixed purpose to keep alive every one of the 276 persons respecting whom—himself included—Luke wrote, "All hope that we should be saved was taken away." God assured Paul, in the midst of their imminent peril, that no one of them would lose his life; and yet it seems from what follows that, in order to their rescue from a watery grave, the sailors must abandon their purpose of escaping in a boat, and must "abide in the ship." God had ordained their abiding in the ship as the means of their all "escaping safe to land," as He purposed they should. Means, moreover, are, by God's appointment, made just as necessary in spiritual matters as in the concerns of this life. It is "through *sanctification of (or by) the Spirit and belief of the truth*," as means, that "God hath from the beginning chosen unto salvation" all that are ever to be saved. "The wicked" must "forsake his way," and must "*return unto the Lord*," if he wants the Lord to "have mercy upon him." God saves no sinner except in the use of appropriate means, and prayer is one of His appointed means. It is to "them that ask Him" aright, that God "gives the Holy Spirit" as a sanctifier and Comforter. "The prayer of the upright is His delight," and His curse rests on those whose hearts prompt them to say, "*What profit should we have if we pray unto Him*." Since, then, He whose "eternal purpose" it is to save all those "whom He did foreknown" has designated prayer as one essential means of grace and salvation, is it not an egregious mistake—yea, is it not fearfully profane to say, that "if absolute prescience be true, prayer becomes . . . an inexcusable absurdity?"

OBJECTION VI. "If we cling to prescience, we must either surrender the moral character and goodness of the Deity, or abandon the endless loss of the soul." "Absolute prescience, and the endless sufferings of individual souls, are propositions perfectly and notoriously incompatible." In other words, if the all-comprehending foreknowledge of God be true, "everlasting punishment" cannot be true, for if it was, we should have to admit that God is not a good Being, and His character would be ruined. If, on the other hand, the wicked on Christ's left "*shall go away into everlasting punishment*," as we fully believe they shall, it cannot be true that God foresaw this when He created them. The foregoing objection is but the repetition, in different phraseology, of the sentiment that pervades most of the preceding objections, and if those preceding ones are fallacious and untenable so is this. While it is certain that God foresaw, before creating them, the endless woe of

all the ungodly, sound thinkers will never have to "surrender," or even to doubt, the "goodness of the Deity." For (1.) the Creator endowed them all with the power of distinguishing right from wrong, and of choosing to obey the dictates of conscience, and refusing to sin; and those that were holy when created, had a chance to remain sinless and be eternally happy. (2.) For the sinners of our race a Saviour has died, and a way of escape from ruin has been opened for all who choose to embrace it; and though multitudes have never heard of this way, the Scriptures represent even them as having sufficient light to render them "without excuse," if they "glorify not the God" whom Nature and Reason and Conscience reveal, "neither are thankful." (3.) Not one of all the lost will have it to say that he could not help being wicked, or that God's foreknowing his awful doom had the least influence in causing him to be what and where he is. (4.) The goodness of God can never be questioned, or His character impeached, because He will in the final day "render to every man according to his deeds"—"tribulation and anguish upon every soul of man that doeth evil, but glory, honor and peace to every man that worketh good." It is the intuitive conviction of all the right minded now, and it will be all men's conviction at the Judgment, that God's mingled goodness and rectitude will require Him to reward the righteous, and send the wicked "away into everlasting punishment." "Behold," says Paul, "the goodness and severity of God;" and what, to some, may now seem to be God's severity, will in the Great Day be seen to be one necessary feature of His faultless character, and even one development of His infinite goodness. And (5.) it will in that Day be seen, if not before, that He who once said, "I make peace and create evil," has overruled all that evil, natural and moral, which He distinctly foresaw when creating the world, and made it promote His own glory, and the best good of "them that love God."

A word or two, in conclusion, in reply to what is boldly said by the rejecters of the doctrine of God's *unlimited* foreknowledge, as to the legitimate influence and effects of that doctrine, as taught in the pulpits and creeds of numerous churches. By one writer it is confidently affirmed, "that the doctrine of the absolute foreknowledge, of God, as taught by both Calvinists and Arminians, is the vile disturber of all theology, and the stronghold of all pantheism, infidelity, and atheism; that its inevitable conclusion is fatality, and that it renders the teachings of all theology self-contradictory and ridiculously absurd in the eyes of every candid, unbiased investigator who is able to trace the doctrine to its logical conclusion." Says the same writer, "Until the teaching of such monstrous dogmas is dispensed with, the gospel will more and more fail to commend itself to the minds of *thinkers*, and infidels will multiply just as intelligence advances." Says another writer, "All theology and commentaries and exegesis must necessarily be completely revolutionized in their basal facts and principles, to meet the philosophical necessities of this age. Foreordination and foreknowledge render the irreversible eschatology of the Bible utterly indefensible and unbelievable." And he adds, "If our theology would overcome infidel vandals and survive the 20th century, she must adhere to logic. A theology that is fallacious in its fundamental assumptions must inevitably lead to infidelity." Hence he maintains that "divine nescience of future contingencies is a necessity alike to logic, and to any admissible thought-system."

Now in reply to this long and imposing array of unproved assertions, false inferences, and reproachful adverbs and adjectives,—"*vile disturber*," "*monstrous dogmas*," "*ridiculously absurd*," "*philosophical necessities*," "*divine nescience a necessity to logic*," "*Bible eschatology rendered indefensible and unbelievable by foreordination*," and the like—I would respectfully say, that unless these gifted gentlemen can present *Bible proof*, clear and unmistakable, that the Nescience theory is sound and scriptural, and unless they can successfully *explain away* the numerous passages of Scripture that *convincingly prove* "foreordination and foreknowledge,"—some of which I have cited in the progress of this argument—I have no fears that any *sound* "thinkers or candid investigators" will view the doctrine I am defending as equivalent to "*fatality*," or as "*rendering the teachings of theology self-contradictory and ridiculously absurd*." And though the "*Nescience*" men seem to think that all the "*logic*" is confined to their side, and that however *sincere* we "*absolute foreknowledge*" old fogies are, we are no logicians or reasoners, we flatter ourselves that we have at least a few on our side, with whom as reasoners the nescience advocates *might* find it perilous to measure sabres. And since "*our theology*" does "*adhere both to logic*" and the Bible, we are troubled with no fears or doubts as to whether it will "*survive the twentieth century*." While we indignantly deny that "*foreordination and foreknowledge render the eschatology of the Bible indefensible and unbelievable*," or that our doctrine "*inevitably leads to infidelity*," we admit that it may not "*overcome*" all the "*infidel vandals*;" for of some persons it is said in the inspired Book that "*God shall send them strong delusion, that they should believe a lie*," and these words are often verified even in our day, and they are applicable to many besides avowed infidels.

It is with pain we notice, gentlemen, that while you have a great deal to say about "*logic, philosophical necessity, a fallacious theology*," and the like, there is an *entire and lamentable absence of Bible proof* in all your utterances in support of "*Divine Nescience*." You profess a profound reverence for the Bible, and yet, strange to say, while we can adduce numerous passages in proof of "*foreordination and foreknowledge*," not a solitary one can you cite in proof of the *limited* foreknowledge or partial ignorance of God. You do, indeed, cite here and there a passage which you *say* is proof, but your interpretation of those few texts will not bear the inspection of skilled exegetes. Now this absence of Biblical proof is an insuperable obstacle in the way of your ever convincing the Christian world that our doctrine is false and yours true. Until you can invalidate our numerous proofs of God's eternal and unlimited foreknowledge, and bring convincing Biblical proof of the theory you advocate, the mass of Bible readers will be found on our side, and not yours. And as for having "*all theology and commentaries and exegesis completely revolutionized to meet the philosophical necessities of the age*," rest assured, gentlemen, that no such revolutionizing process will ever take place, except in the minds of the few who exalt *philosophy* and "*science falsely so called*" above the oracles of God. It was an eternally foreseen fact that "*profane babblings and oppositions of science falsely so called*" would prevail, and that men would be in danger of being "*spoiled through philosophy and vain deceit*;" but from true science and genuine philosophy the Bible has nothing to fear. "*The word of the Lord endureth forever*,"

and sooner might one hope to arrest a whirlwind in its awful sweep, or upheave the Himalayas or Andes from their base, than hope to subvert or disprove a single truth of God's ever enduring word. "Infidel vandals" may, with God's consent, still abound, other Porphyrys and Humes and Paines and Ingersolls may spring up, "like frogs out of the mouth of the dragon," and defile the world with their slime, or poison some with their venom, but what God hath spoken in His holy Book is just as enduring as He and His throne are, and neither men nor devils will be suffered to overthrow it. He of whom it is said, "O Lord, are not thine eyes upon the truth?" will see to it that "amid the wreck of matter and the crash of worlds," all truth, and especially "The Truth," shall outlive time and be immortal.

ASHLAND, N. Y.

"IN THE BEGINNING GOD CREATED THE HEAVEN AND THE EARTH."

BY REV. M. STAPLE, D. D.

No intelligent person can read the Christian Scriptures without being impressed with the sublime simplicity in which the primordial facts of the Christian system are presented.

The opening sentence of the *Divine* record furnishes a beautiful illustration: "In the beginning God created the *Heaven*, and the *Earth*." In ten words the most sublime facts that come within the grasp of finite intelligence, are so distinctly presented, that no possible emendation of the sentence can be suggested, that would not mar its beauty, and weaken its force. The *being* of God and the *creation* of the physical universe, are not only distinctly stated, but these two facts are exhaustive of the import of the terms employed. The most careful and critical examination cannot by any honest interpretation cast even a shadow upon the designs of the Author, whoever the author may be. The statement is, not problematical, but authoritative, and must be accepted as a full and sufficient answer to the question, whence the Physical Universe? or be rejected as a myth, or as a base attempt to practise upon the credulity of mankind. We have presented in the passage at the head of this article, two facts stated on which all natural and revealed religion rest. The first is a "*Personal God*," self-existent and Infinite in all his attributes. Secondly, the creation of the universe of matter, causing that to be that had no prior existence except in *His* own Infinite conception and purpose.

That the existence of God, and a positive creation by *Him*, is incomprehensible to finite beings, however exalted, we most cheerfully admit. The finite cannot comprehensively contain the *Infinite*. Yet, man has a very clear and distinct conception of an *Infinite GOD*, who is cause of *all* outside of *Himself*. That mystery is a necessity of man's being will hardly be denied; consequently, the rejection of the *Bible doctrine of God* opens up to us no escape from our environment of mystery. All the facts of existence remain the same, and will imperatively demand a reason for their being. Let this fact, then, be kept in mind.

Now, whence came this conception of the *Infinite* one? Of whom was it born, and by whom begotten? For the possession of such a marvelous conception reaching out and searching for a spiritual entity, an adequate cause for its existence is demanded, and will continue to be by all honest inquirers after truth. The human mind cannot rest in a mystery of darkness. It must and will inquire for that which is incomprehensible within and without its selfhood, an intelligent cause, for it is

only in *such* the human soul can find repose, and the inspiration of hope.

There are but *two* sources from which man could originally derive his notion of God, and its cognate ideas. One is *Revelation*, which involves the existence of God, and His intercommunication with man. The other and only remaining source is *Nature*; for if there be no God, *Nature* is *all*, and in *all*, self-existent, self-sustaining, and self-governed. Whatever, therefore, exists, is part and parcel of Nature.

Man is the offspring of God, possessing a nature that identifies him with the *Author* of his being, and capable of receiving instruction and inspiration from him, or he *is*, in the entity of his nature and experience, the production of a physical cause. If nature is *all*, then man, with all his boasted powers, and various experiences, is as certainly the result of purely physical causes as the form, color, texture and flavor of an apple, or any other fruit.

The *Christian* idea is, that man is the offspring of a "*Personal God*"; and this is all we design to remark in this connection, as it is not the object of this article to vindicate the Bible account of the origin of matter, or of man, but to call attention to the logical results, of the materialistic theory that finds cause for life, in all its forms and manifestations, in "*non-living matter*;" nor shall we attempt to show the absurdity of the bold assumption of the existence of matter without a *Divine Creator*, which assumption forms the corner stone of modern "*Atheism*."

Now let the reader bear in mind that this theory puts God entirely out of the question. That it not only discards the *Christian God*, and *all revelation*, but admits of no intelligent cause prior to the existence of matter. Life is not the cause of matter, but *matter* is the primal cause of *all life*.

That this statement of the views entertained and advocated, with great zeal and devotion, by men who claim to be the prophets of a *godless* universe, we have their own declaration as proof.

Prof. Huxley, propounding his philosophic faith upon this fundamental question, says, "If it were given me to look beyond the abyss of geologically recorded time to the still more remote period when the earth was passing through physical and chemical conditions which it can no more see again, than a man can recall his infancy, I should expect to be a witness of the evolution of living protoplasm, from not-living matter." The italicising is mine. We simply call the reader's attention to the fact that while the author's expectations are so very large and strongly expressed, he has taken no pains to inform us how a substance can evolve from itself that which by his own statement it did not contain. It certainly looks very much as though the vital question at issue is cautiously avoided. "Evolution" of living protoplasm, from not-living (dead) matter is certainly a high-sounding phrase, but some people will be at a loss to discover any basis in reason for, or common sense in, such a statement.

But Prof. Huxley would expect to see all this, and we must accept his expectation as sufficient proof, however contradictory and self-stultifying it may be. But he is not to be left alone in his glory; the honor of this grand discovery is too much for one self-confessed descendant of a monkey to inherit; so Prof. Tyndall steps forth and discerns in matter the premise and potency of *all terrestrial life*.

Surely the expectations of Huxley, and the discernment of the author of the Prayer test, ought to be accepted as sufficient proof that life was

evolved from not-living matter. As no higher reason, or better, or additional evidence of so astounding a discovery has been presented, for the sake of the argument we reverently accept the dictum of these eminent scientists. That there was a time in the history of the *globe* we inhabit when *life* was *not*, is admitted both by science and revelation. On this point they harmonize. This admission is all that is necessary in this connection; but the fact itself is of the highest import. *Time* was when there was no *life*; nought existed except not-living matter; therefore, it follows that *all* life on this *globe*, in all its forms and degrees and manifestations, had its origin in death. This is the primordial fact upon which all life rests; but for the evolution of life from *not-living matter*, life could not have been.

This is the fundamental, scientific assumption on which the entire superstructure of the materialistic philosophy rests. Be it also remembered, this is not a conclusion reached by opponents of the theory under discussion, from the assumption of doubtful premises or faulty logic, but the clear and unmistakable declaration of the high *Priests of materialism*.

Here then is the beginning of life, and all we have to *do*, is to believe it, on the authority of Huxley, Tyndall & Co. They assure *us* that this production of life from this source is perfectly natural; indeed, that the evolution of life was nature's first grand effort, and that the law of nature was, and is, and always has been, to evolve something it did not in itself contain. Consequently, when the time came it was the most natural thing conceivable for a man to be evolved from a monkey.

It would indeed be a miracle for a living *man* to impart life to a *dead* substance, but for dead matter to produce a living, thinking personality is such a trifle that our highest reason should be satisfied, without a particle of evidence to support the assertion! But the philosophy of the operation is altogether unthinkable. One thing is certain: it was not from forethought, or design. Intention or purpose was entirely out of the question, and must not be interpolated *even* in our thinking or reasoning upon the subject; for the materialistic theory of the origin of life cannot survive the introduction of reason or logic for a moment; for design involves *purpose*; and a previous mental *arrangement* that harmonizes with the purpose formed, and that works toward the contemplated object. If the student of the physical universe thinks he perceives evidence of intelligent design, for instance, in the structure of the human *eye* and *ear*, he is altogether mistaken. These and all the seeming adaptations of means to ends that are apparent all along the lines of nature's operations have their cause, not in intelligence, but in "not-living matter." Thus nature in all her phenomena has been testifying to a falsehood, and in thus evolving the highest order of beings she has produced a grand delusion. So successful indeed has been the deception, that it required the profound wisdom of *our modern materialist* to discover the *cheat* and demonstrate that *life* and all seeming intelligence had their origin in death or dead matter. To cap the climax of nature's achievement she has evolved *man* with all his supposed intellectual and moral powers, produced in him the conception of an *infinite God*, the creator, and law-giver of the Universe; wrought in him the consciousness of moral responsibility; endowed *him* with religious sentiments, and the idea of a *future life*; inspired him with a hope of *heaven*, and fear of *hell*; and by *him* produced the "Decalogue," the

"Story of the Cross," organized churches, and "Missionary" societies, to convert the *heathen* world! In a word, all the superstitions of the present and the past are simply and entirely the outcome of physical cause, and that *cause* primarily "not-living matter."

Thus *nature in man* has wrought out a stupendous *living lie*, before which all other falsehoods dwindle into insignificance. If the original assumption be true, viz., that *life* was evolved from "not-living matter," then it is also true that all that now exists, inclusive of *man*, with his intellectual and spiritual activities and prospective possibilities, are but fruits of this same primeval cause, namely, "not-living matter." We are thus forced to the conclusion, that nature, and not the devil, is the "father of *lies*," if modern materialism be a true philosophy.

NEW CANAAN, CONN.

A KIND LETTER FROM PROF. KEPHART.

WOODBRIDGE, CAL., April 11, 1884.

Dear Dr. Hall:—

The *MICROCOSM* for April came to hand yesterday, and having read your admirable reply to Dr. Roberts, I desire to "strengthen your hands" by dropping you a line of congratulation. Indeed, words cannot express my admiration of, and delight over, your masterly analysis of the whole subject of cold and heat. In fact, I am more *proud* of you than ever. The able, impartial manner in which you have treated this "cold and heat" question must convince every candid reader that you are a bold, honest advocate and lover of truth—well posted respecting the fundamental facts of science, and not an ignoramus or mere crank who is riding a hobby and blindly advocating a pet theory. Were you the latter, you surely would have fallen in with Dr. Roberts' mistaken theory, because it at first sight seems to be in exact harmony with Substantalism. But the fact that you "*dig for the truth*" rather than accept a theory even when self-interest seemed to urge you to do so, demonstrates the fact that you are a candid investigator, and not a mere thirster for a little vain glory. Would that as much could be said in favor of the leading scientists so called of to-day. Louis Agassiz said that Darwin's anxiety to establish a theory rather than to ascertain the *facts* of science, caused him to overlook the evidence that disproves evolution. The same candor that characterizes your treatment of the "cold and heat" problem, would have caused Profs. Mayer and Tyndall long since to have taken up the assaults upon the wave-theory of sound, and either shown wherein they are illogical or otherwise deficient, or to acknowledge the erroneousness of said theory. That you completely substantiate your position, and as completely annihilate the position of Dr. Roberts, must be apparent to every candid reader of the *MICROCOSM*. And yet you do it so clearly, concisely, conclusively, *severely* (and yet humbly and gentlemanly with all) that your *manner* excites my admiration almost as much as do the irresistible force of your arguments and the clearness and conclusiveness of your illustrations. May the good Lord bless you, and add to your life many more years, is the prayer of Yours very truly, I. L. KEPHART.

Next number being the last of this volume, all true friends of THE *MICROCOSM* will commence renewing for Vol. 4 as convenience may permit. We trust that many of our old subscribers will renew by becoming life-subscribers. See special notice elsewhere.

THE CHRISTIAN STANDARD vs. ELD.
THOMAS MUNNELL.

[The following is the *Standard's* reply to the first part of Eld. Munnell's argument as printed last month.]

In the *Standard* of February 23d, the office editor, partly for his own amusement and partly with a better motive, devoted about half a column to Bro. Munnell's statement of Wilford Hall's chief objection to the wave-theory of sound. For prudential, or other reasons, Bro. Munnell's reply is given, for the most part, by verbal inspiration, in the language of the great spirit of Substantialism, that has been of late years bringing to light the mysteries of incorporeal corpuscles. This is well, and every way satisfactory. While it might be just, it would not be generous, to hold Bro. Munnell responsible for the feats in intellectual gymnastics exhibited in this writing which he endorses, as it is clear he has not been behind the curtain. Our exposure, therefore, though directed to Bro. Munnell, will apply rather to the real performer, who for several years has been pressing upon public attention objections to the wave-theory of sound, and seeking to establish what he calls the corpuscular theory, and he has not only succeeded in causing hundreds of intelligent and scholarly men who have forgotten their philosophy, to regard his objections as insuperable and his corpuscular theory as established, but he has also led them to believe that his corpucles are doing valiant service in driving back the hordes of infidelity, and in establishing the doctrine of the immortality of the soul and a future life! Now, though it may seem somewhat bold, we propose to show how such feats are performed.

It is a fact that the wave-theory of sound does teach that a locust, by the motion of its wings, is able to set in motion, in waves, all the air contained in a space of four cubic miles; and that such waves will reach the human ear a mile distant in about five seconds, with a force sufficient to produce on the auditory nerve the sensation which is called sound.

In order to show this to be impossible, the writer tells us of the *weight* of the air, how that four cubic miles of it presses on the earth's surface with a force of 20,000,000 tons. True enough. Indeed, on four square miles of the earth's surface the pressure of the atmosphere, which extends, say fifty miles upwards, presses with the weight of about 120,000,000 tons!—that is, over one ton to the square foot. Yet the rims of our straw hats remain horizontal, and our umbrellas, though loaded with about sixteen tons, in addition to a pelting rain, do not crush us to the earth! If a sheet of tissue paper four miles square was spread out over four miles of the earth's surface, like a carpet upon the floor, supposing the paper itself to be as light as air, and if four locusts were attached to it by a cotton thread, one at each corner, they would be able to fly upward, slowly of course, bearing with them, and setting in motion, over 120,000,000 tons of air. And after ascending nine feet from the earth's surface it would be difficult for a man of 200 pounds avoirdupois, without wings, to "overtake" them except by the assistance of some mechanical contrivance. Beside, all the air around for miles would be set in motion, involving, at least, another 120,000,000 tons! How valuable is mathematics! How deep is philosophy! falsely so called. It may be replied that the air under the tissue paper and under our hats and umbrellas *presses equally in all directions*. Just so; but does it not *press equally in all directions about and within the locust* when it is stridulating?

Thus it appears that air weighed in air is without weight, and hence can be moved in almost measureless quantities by the flutter of a wing. All this noise, therefore, about its tremendous weight, is misleading. In the same way, water weighed in water is without weight. Consequently, a bucket at the bottom of the sea, if held in equilibrium, though holding a million tons, can be drawn to the surface by a woollen string; and a great part of the ocean, if not the whole of it, set in motion besides. Thus we dispose of whole tons of legerdmain. But seeing all this, the author now assures us that it is not the mere moving of so many tons of air that constitutes the difficulty; it is "the *sudden displacement*" of so much air and the "repeating" of it "440 times a second" that is so insuperable. He admits that "by steady pull" millions of tons of air can be easily moved, being in equilibrium. It is now "the sudden displacement" of the air and the "repetition" that would require more than "a hundred manilla cables." This is said to be an "almost infinitely greater task than displacing in one direction by steady pull." Well, let us test this emphasized feature of the case.

A sick locust can flap its wings *once* in a second "in one direction by steady pull," while a healthy locust can repeat this "displacement" the required "440 times a second," which, according to Bro. Munnell, is "almost an infinitely greater task!" What are a few millions of tons of air on the wings of an animal confessedly capable of outstripping one of its fellows almost "infinitely?" A common gnat moves its wings 15,000 times in a second. According to Bro. Munnell's geometrical ratio towards infinity, such *rapid* "displacement" ought to shake creation. But seriously, is it true that rapid vibration requires such increasing power? One illustration will *annihilate forever* the assumption.

By steady pull a boy draws on a bell rope when the clapper is muffled by being tied. The bell moves in one direction. There is no vibration of the metal. The clapper is loosed. The boy pulls again, and the entire metal composing the bell, of, say a ton weight, "*vibrates 440 times a second*." What becomes of the "almost infinitely greater task?"

When a young lady strikes the lowest note of a seven-octave piano, causing twenty-seven vibrations per second, and then strikes the highest note, making 3,500 vibrations, she is not conscious of having performed in the latter stroke "an almost infinitely greater task" than in the former. Thus Bro. Munnell's undulatory objection, arising from the supposed difficulty of "*rapid displacement*," is forever stilled. The *rapidity* of the motion does not cut the figure which he claims.

As if seeing all this coming, he tells us that the rapid undulation of the 20,000,000 tons of air, supposed to be caused by the stridulating locust, is "but a bagatelle compared with what the locust has to do, if the wave-theory be true." He then brings in as "something *solid*"—it is time something solid was coming—untold millions of imaginary "drum skins," and claims that the force that would carry sound-waves through four cubic miles of unobstructed air must necessarily be able to carry the same waves through the same air, though obstructed by "two thousand million tons of drum skins"! If this follows, it must be because this appalling amount of "solid matter" is no *obstruction at all*. If it is an *obstruction*, its vibration is not included in the wave-theory. Such "tympanic membranes" would quench the sound and still the waves before

they would reach the one-hundredth part of their unobstructed destination. Why not? But for the sake of plainness let us perform a similar feat against what may be called the shot-gun theory. A good shot-gun, Bro. Munnell's, for instance, will carry shot 500 feet with a force sufficient to pass through a quarter-inch shingle, *at any point along the way*, "whether the" shingle "is there or not." Well, then, after our brother's style, let us suppose the shingles to be all there, set up on end, side by side, each occupying its quarter-inch of space. This will give us 24,000 shingles, that is, 6,000 inches of "solid matter," which the shot must be able to pass through, according to the "shot-gun theory"! Now let Bro. Munnell bring on his "tympanic membranes," and we will fetch the shingles. Our locust shall shake the "drum skins" before his shot-gun shall cause the shot to pierce the 500 feet of timber. Let us have the "solid tendinous matter."

How weighty is the air! how difficult its rapid vibration! how mighty the locust! (but especially the gnat!) How obstructive are ear-drums! How destructive shot-guns! How easily bored are 500 feet of solid timber! Since everything else is confessedly a mere bagatelle in comparison, let the ear-drum argument be sustained or withdrawn.

REPLY TO THE FOREGOING.

BY ELD. THOMAS MUNNELL.

One important secret is now out. The "office editor" admits himself to be the veritable writer of the articles in the *Standard* against Wilford Hall's views on the sound-question. This is good, for we are delighted to know that we have so able a scientific investigator to meet in this controversy. Plainly, if he fails to vindicate the wave-theory of sound, or to shake the fundamental arguments in Wilford Hall's assault, then all lesser lights may stand from under. The office editor further confesses that he began his criticisms "partly for his own amusement, and partly with a better motive." This is also good, as we are glad to know that he loves *fun*. We propose in this response not only to *amuse* him, but to make it intensely entertaining to his readers.

First, he mistakenly declares this locust-problem to be "Wilford Hall's chief objection to the wave-theory of sound." Whereas it is but one among a dozen of his chief objections to that theory, several of which he regards as even stronger than the locust-problem, as he has always claimed. (1) The exceeding slow motion of a tuning-fork's prong while sounding audibly (traveling at a demonstrated velocity of *only one inch in two years*) he regards as the most conclusive of all objections; for how can such motion condense the air and send off waves at a velocity of 1,120 feet in a second? Hence he claims that sound can not be air-waves, but must be substantial pulses analogous to electric discharges. If the editor wishes genuine "amusement," let him attack that position. Then follow (2) the fraudulent "law" of so-called "sound-interference," which should be a true law, if there be any truth in the wave-theory. (3) The free passage of sound through all solid bodies, such as metal, wood, etc., demonstrably without any motion whatever. (4) The argument deduced from the analogy of the other senses, such as *smell*, for example, which can only receive its impressions from the substantial contact of odorous corpuscles, etc., etc.

But now for our answer to the office editor's amusing criticisms. He frankly admits that a pound of *water* or a pound of *quicksilver*, enclosed within such liquids in equilibrium, is just as *weightless* as would be a pound of *air* enclosed

within the surrounding atmosphere. He admits further that the four cubic miles of air actually weigh 20,000,000 tons; and he still further admits that the locust does really shake this entire mass of air by its stridulating effort, displacing it 440 times a second, and for about a minute at a time. Yet he makes the surprising plea, to justify this impossible feat of an insect, that the rim of his hat, his spread umbrella, or even a sheet of tissue paper, is not bent or buckled in the least at the earth's surface with millions of tons of atmosphere pressing down upon it! He surely must have forgotten his philosophy, for every student knows that if our whole atmosphere were an ocean of *quicksilver*, his broad-brimmed hat, or even a spread sheet of tissue paper, at the bottom of such ocean, would remain perfectly flat and horizontal! Why? Simply because this enormous weight of liquid presses alike in all directions. But does this prove that a pair of locusts could move even a single ton of this liquid metal if enclosed in a sack and placed below the surface of such ocean, in equilibrio? Yet the editor insists that two locusts could fly away with 20,000,000 tons of *quicksilver* thus submerged, since it would be precisely the same exploit as dragging off 20,000,000 tons of air similarly enclosed in air. The truth is, an insect could no more fly away with a single ton of air in its own element, though occupying much more space, than it could move a ton of *quicksilver* resisted by its element. Each element resists equally the displacement of a given weight of itself.

Here is the new philosophical *law* which this discussion has evolved: *The resistance of any surrounding liquid element to the displacement of a given quantity of its own material, is exactly equal to the resistance from inertia of the same quantity of the same material, if freely suspended in vacuo.* Of course this *law* is to be found in no book, because the new departure on sound which claims to overturn the wave-theory, making sound a substantial entity, has necessarily to develop new *laws* in physical philosophy, while destroying old ones to meet the new emergencies that are continually arising. To illustrate the law just presented: The resistance to sudden displacement which a *pound of quicksilver* would encounter by contact with the surrounding metal, if floating in equilibrium below the surface, would be exactly equal to the resistance which it would encounter from its own *inertia* if the same pound of quicksilver were freely suspended in *vacuo*. Hence, to enable the office editor to see the fallacy of his reasoning, he has only to suspend (in his imagination) the 20,000,000 tons of air in *vacuo*, or to suspend 20,000,000 tons of quicksilver in like manner, and then set his "sick" locusts to jerking the mass back and forth 440 times a second, we care not how small a distance, or flying away with it. They would make just about as much headway in stirring it as the editor will in stirring the Substantial Philosophy.

But leaving these elementary principles, let us come to close quarters with our critic on the chief feature of the locust-problem, namely, the exertion of mechanical force by the insect sufficient to shake and displace bodily 2,000,000,000 tons of tympanic membranes. He has squarely joined issue with us on this phase of the problem; will he now risk the truth or fallacy of the wave-theory upon this single field of battle? Our presentation of that feature of the argument, in the article to which he last replied, was most explicit and unmistakable. The reader has only to reglance at that statement as given in the *Standard* of March 29, and it saves us the space of repeating it here.

What, now, does the critic offer by which to break its force? He admits that the locust could be heard at any point of air large enough to contain a living drum-skin throughout the four cubic miles. He accepts the wave-theory that we only hear the locust's sound by the bending in and out of our ear-drum 440 times a second, and consequently that every part of this enormous mass of air, large enough for such a drum-skin to vibrate in, is shaken or displaced by the strength of the insect with a mechanical force sufficient to shake such a membrane if present, since an ear anywhere could hear it. But after all these admissions so fatal to the wave-theory, his only attempted answer to the argument is, that if the whole four cubic miles of air were thus closely studded with ear-drums, the sound would not travel more than a short distance, and that these obstructions "would quench the sound and still the waves before they would reach the one-hundredth part of their destination!" Of course this is so. Who could be so stupid as to suppose anything else? But does this disprove the fact, after admitting it, that the insect exerts a mechanical force upon all parts of the four cubic miles of air equal to the displacement of a drum-skin at each space large enough to contain one? By no means. It simply proves that this mechanical force thus exerted by the insect, instead of extending a mile in all directions would, if obstructed as supposed, expend itself upon the obstructing mass of ear-drums close to it, thus shaking them the more violently! But such damming up of these innumerable streams of mechanical force, going out from this stridulating engine, in no wise lessens the sum-total of the physical energy it exerts, or detracts from the 2,000,000,000 tons displacing-force which, when unobstructed, went forth in the shape of condensed air-waves to all parts of the four cubic miles. Surely a critic accustomed to philosophical thought ought to grasp this idea. The reader will be startled by its clearness in a moment.

But being limited for space, let us close our answer by disposing of the critic's most unhappy illustrations. In our arguments we incidentally refer to the 440 mechanical waves which the locust has to send off by the motion of its wings and legs. Of course this rapid vibratory motion of the insect's sounding apparatus is a matter of no consequence only as it involves the exertion of mechanical force sent off to a distance, as the wave-theory absurdly teaches. The 440 movements of the locust, or the 15,000 by the gnat, in a second, are easily accomplished by these insects on the Substantial view of sound, but they involve the absolute horse-power of thousand of locomotives if the wave-theory be true. Hence the fewer such prodigious stridulating movements in a second, the safer it is for the corporeal organism of the unfortunate insect which has to produce them; for it has to displace the whole twenty million tons of matter by its individual strength at each of such movements! Sonorous bodies, such as the bell or piano-chord, also vibrate easily, by a natural law of tension; but if they had to perform the mechanical labor which the wave-theory attributes to them in condensing the air, they could not vibrate at all. The free or unconfined air is not a sonorous body, and only moves as it is displaced mechanically, however many times a second, by some extraneous force. Instead of making the boy, for example, swing the bell once in a second, the extent of his power, why did not the critic let the boy imitate the locust and swing it 440 times a second? We admit that there is no more power required for a young lady to strike a string of a piano that makes 3,500 vi-

brations in a second than one making twenty-seven vibrations. But this is not the point. Why did not the critic have his young lady strike the key with her finger twenty-seven times in a second, if she could, and then force her to imitate the locust by striking it 440 times in a second? Even a "sick locust" ought to see the difference between the two operations. But as our critic is no doubt sufficiently amused on this point, we now come at him with his own deadly shot-gun argument, and let him look out.

The truth is, we always feel sorry for any man who stumbles upon a capital illustration of a scientific idea, and then don't know how to handle it. There never was a better illustration of our locust problem, and its invincible logic against the wave-theory of sound, than a gun, properly constructed and operated. But a common "shot-gun," even as good a one as "Bro. Munnell's," is preposterous. For example, what comparison is there between a gun that shoots only one charge in a minute, with a given mechanical force, in only one single direction, and our little *stridulating shot-gun*, which, according to the wave-theory, sends out 440 effective charges per second, or 26,400 per minute, and in more than 10,000 different directions at the same time, each shot, as our critic believes, having also a given mechanical force even for a mile away? Suppose his gun to fire one charge in a minute, in one direction, sending the ball 500 feet in a second, with a force sufficient to shake a suspended block of wood weighing, say 100 pounds. Now, such a gun must evidently exert the same mechanical force upon the air, or a displacing force of 100 pounds, no matter whether the 100-pound block is in range to be hit or not. But suppose the gun to be so improved that it would fire 440 such shots per second, each with the same force; that is, suppose it sends out a continuous stream of such balls about a foot apart; it is perfectly evident that it would, during the continuance of this stream, exert a displacing force of $440 \times 100 = 44,000$ pounds on the air whether one of the balls should hit a block or not. Then, if the gun were to be still further improved, on the plan of our patent *stridulator*, so as to fire a similar stream of balls in 10,000 different directions at the same time, as does the locust, it is clearly manifest that the mechanical displacing force it would exert on the air would be correspondingly increased, or in the aggregate amount to a force of $440 \times 10,000 \times 100 = 440,000,000$ pounds, without the least reference to whether a single block of wood were actually hit or not. How beautiful and clear is this illustration! Then suppose the whole surrounding air for 500 feet to be filled with the suspended 100-pound blocks of wood, thus representing the actual displacing force of such a *wave-theory gun*, just as our critic proposes to fill the air with drum-skins, is it not perfectly plain that instead of the balls going 500 feet they would all expend their force upon a very limited shell of the blocks near the gun, thus stopping their further progress, though shaking these blocks the more violently? In the language of our critic, these blocks would "*still the balls before they would reach the one-hundredth part of their destination.*" No one, however, but an advocate of the wave-theory, would ever have supposed that a gun, thus merely checked in its range by obstructions, would exert any the less mechanical force on that account! We court the critic's self-annihilating illustrations, and the more the better; though it obliges us to consume time and space to disentangle the loose and illogical reasoning he bases upon them, all, as we suppose, "for his own amusement." THOMAS MUNNELL.

PROF. GOODENOW REPLIES TO OUR MARCH EDITORIAL.

We give below Prof. Goodenow's reply to our editorial in the March number of *THE MICROCOSM*. For the convenience of our readers, and to insure a careful perusal of his entire article, we number his paragraphs from 1 to 21, and add after each our own comments in brackets, instead of a separate paper. This brings each point the Professor makes, and our answer to it, in direct juxtaposition. Such mode of replication we trust will be satisfactory all round:

INERTIA AND ELASTIC FORCE.

BY REV. PROF. S. B. GOODENOW.

(1.) I have made it plain (Oct., Jan. and Mar.) that "perfect elasticity doubles the force *imparted* from one mass to another."

[We made it plain in our reply in the March number that the Professor distinctly contradicted himself by teaching the exact opposite of what he here says he had made plain. Here are his own words which we then quoted:

"This is seen by the experiment with two ivory balls, suspended so as just to touch; the one being drawn back and let fall imparts *all its force* [not *doubles its force*] *to the other and stops*, while the other *takes all the force* [not *double the force*] *and goes off with the same motion* [not *double the motion*, as it should do with *double force*] *as if it were the ball let drop.*"

Hence, to say now that he "made it plain," with this self-contradiction standing unrefuted, is surprising, to say the least.]

(2.) This proposition of mine is in harmony with all my other statements. And it remains entirely unimpeached; although an attempt has been made to invalidate it, and to set it against my other teachings.

[Not only an "attempt has been made," but a most successful attempt, as the above extract shows, in which he distinctly teaches that "all its force" goes from the striking ball through the row by elasticity—not "double" its force. But so far from elasticity transferring even all the force imparted (to say nothing of doubling it), we abundantly demonstrated last month by our new law and definition of elasticity, that each indentation causes a loss of just *one-half* of the mechanical force which produces it, even with perfect elasticity, by the molecular friction of the body indented, and which unavoidably occurs in the acts of compression and restoration. We refer the reader triumphantly to that argument and its accompanying demonstration (pp. 315, 316), as a complete reply to every thing the Professor says in this article, since his argument is all based on the mistaken idea that perfect elasticity causes the same amount of mechanical force to be exerted in recovering form as it took to produce the indentation, which, as above stated, we have clearly demonstrated to be erroneous. Hence, as a refutation of each paragraph in succession, we would only need to refer to that new law and its demonstration. But we will, besides that, add remarks, in elucidating the details of his arguments].

(3.) I have not said that "elasticity doubles the force," but only that it "doubles the force *imparted*." It cannot change by a particle the existent quantity of force, which by the "conservation of energy" must be ever the same. But it can and does double the impartation of force, and the proportion of force "imparted" from one body to another.

[Nothing can give a stronger proof of the desperation of the Professor's involvement than this

attempt to escape from the difficulty. We have looked at it several times to see if it were not possible that our eyes deceived us as to the words he uses; but there is no mistake. He says he does not mean that "elasticity *doubles the force*," but only that it "*doubles the force imparted*!" Now what other force was he talking about, or what other force were we criticising, except the force imparted to the row by the striking ball? Did anybody suppose he meant some outside force not "imparted" to the row? Did he suppose that we could understand him to mean the force exerted by some distant waterfall, and that the elasticity of the row of balls doubled that force? He simply meant, as he explains it himself in his March article, "the *whole force* goes from the striking body to the ball struck, leaving the former at rest." Then is not the "whole force" of the striking ball *doubled* by the elasticity of the ball struck? It certainly is if the whole force is *imparted*. Now what says the Professor in the very *same* paragraph (March No., page 241)? "The one ball being drawn back and let fall *imparts all its force to the other and stops.*" Hence, as the force is all *imparted* and elasticity "doubles the force imparted" it necessarily doubles "all the force" or the "whole force," thus creating as much new force out of nothing as the striking ball originally produced! Where, then, is the "conservation of energy?" It had been much better if the Professor, in the language of Mr. Oglesby, had frankly "confessed the corn."]

(4.) If this precise statement, as made by me, just as above, had been noted and not turned aside, two precious columns of the March *MICROCOSM* would have been saved to the editor.

[Can any reader of this magazine see that this "precise statement" helps the Professor in the slightest degree? If he can, we ask him in all charity to give him the benefit of the doubt. For ourselves, we totally fail to see that it has the slightest bearing on the subject, except to make the Professor's self-involvement more glaring.]

(5.) After these two columns (p. 244-5), the editor goes on to raise and treat *three objections* to the law of Elastic Transfer of Force, as expounded by me. (1.) He claims a *limitation* to the duration of force, making it rapidly run out when transferred; discussed in five columns, to the beginning of p. 248. (2.) He claims that there is *no such thing* as Elastic Force by means of which other force is said to be transferred; discussed in two columns, p. 248. (3.) He claims that air pressed into a tube must affect the air at the other end of the tube *more or less quickly*, in proportion to the pressure used; discussed in five columns, p. 249-251. He closed with near two columns of incidental comments (p. 251-2); making *fifteen and a half columns* in all. How many columns shall I have for reply? Notice.

[No reply to this paragraph is needed except to say that the Professor has had in his three articles besides this one, a very liberal allotment of space in which to explain his views on the elastic transfer of force. He here has another two pages, and ought not to complain.]

(6.) 1. The claim of a *limitation* to the duration of force, making it rapidly run out when transferred. At p. 244 we are told, striking "force but for elasticity would be immediately *absorbed or used up*, so to speak, in the two bodies striking each other." And at p. 245, that in passing through a row of suspended balls "a certain amount of the force is *neutralized* for each ball used." And at p. 246, "enough balls can be added to *consume* the entire force imparted."

(7.) Now, on the contrary, we learn from the

fundamental law of the "conservation of energy," that no force is ever lost or created; it can only be *transferred* to different bodies, or *transformed* into different kinds. All such absorbing, neutralizing, consuming, losing of force, as is here spoken of,—as if it were no longer force,—is out of the question. The editor's remarks on elasticity exactly apply here, (p. 244). It can create no force; it can destroy no force. That is true. It can only transfer or transform existing force.

[These two paragraphs together admit all we claim, namely, that the *force* of the striking ball, though *conserved* or *still existing* in the form of heat, or some other form of the force-element of Nature, which we never doubted, ceases to exist as mechanical force, or that energy which is required to displace "indefinitely" "any number of ivory balls"! When we speak about the force of the striking ball being *consumed*, *neutralized*, *lost* or *used up*, we, of course, refer to its consumption or loss as mechanical energy. Wood exists in some forms and in all its original elements, after being burned to ashes; but what quibbling to say it is not consumed, lost, used up or destroyed! We would like to see the Professor try to build a house out of such wood on his boasted theory of the "conservation of energy," or the "indestructibility of matter." Just so we would like to see him try to move an indefinite number of ivory balls by the mechanical force of one striking ball after it has been consumed or used up in heat by the molecular friction encountered in producing and restoring an adequate number of indentations in ivory. Is it possible that the Professor cannot catch the true idea of such consumption, loss, or destruction of mechanical force?]

(8.) But *how* is the force "consumed" as alleged? At p. 246 we are told: "Some of the striking force has each time to be *consumed* in *overcoming* the *inertia* of the ball at rest, and the remainder goes into its motion." And this is repeated in many ways.

[Of course it is "repeated in many ways," and of course it is literally true, with the explanation just made, that force can be *lost*, *consumed* or entirely *dissipated* in one form (mechanical energy) while its conservation may be equally true in some other form or forms. Yet the Professor wastes paragraphs by not making this rational distinction.]

(9.) Here we have again cropping out THE GREAT CURRENT ERROR concerning *inertia*, which befogs so many minds, and has so misled the MICROCOSM all through, especially in the gravitation argument. Let us here once for all set that matter at rest.

[The reader who has carefully studied our last month's editorial on inertia and elasticity, and the overwhelming proofs of the false teachings of the text-books, will be able to form a pretty correct idea as to who is befogged on this subject.]

(10.) "Static inertia," or the *inertia of rest* is not a force, requiring force to "overcome" it or "neutralize" it; it is only *mass* requiring to be *moved*. So that the moving of the mass is the overcoming of the inertia. And the inertia overcome is shown by the motion or momentum acquired, (i. e., by the *mass and velocity* of motion.) Mark well, that nothing but the moving of a mass is the overcoming of its inertia. And then observe the fatuity of saying that "Some of the force has to be *consumed* in overcoming the inertia, and the remainder goes into its motion" (!) That is curious enough.

[Nobody says that *static inertia* is a force; but it is a factor of *resistance*, and requires the consumption of mechanical force to overcome it.

otherwise an ounce ball let drop would knock a pound ball away as easily as it would a feather. True enough, nothing but "*the moving of a mass is the overcoming of its inertia*"; but does this show that it does not cost mechanical force to move a mass? It would be very curious were it not so. We suspect somebody is befogged. If a stone requires one hundred pounds of pushing force to move it, and the Professor exerts the requisite energy to displace such stone, would it not be approximately correct scientific language to say that ninety-nine pounds of his force goes in friction, heat, etc., and the remainder into the motion of the stone? Is there anything curious about this?]

(11.) But what is more astounding, at p. 246 we are also told: "A small portion [why small?] of the striking force must necessarily be deducted [why deducted?] for overcoming the inertia; *which inertia is simply the downward force of gravity*, that has thus to be neutralized." Indeed! Inertia is Gravity! Is not that a novelty? And then, "gravity has to be *neutralized*." (Where is conservation?) This makes one think of the like oracular query long ago in the same quarter: "What is projectile force *for*, if not to *neutralize* gravity?" We have seen that force cannot be "neutralized," but only *transformed*. And into what is force transformed when "inertia is overcome"? Simply (by transfer) into the *motion* imparted.

[More *fog*. We venture to assert that Prof. Goodenow cannot tell what it is that constitutes *mass*, and thus causes inertia, unless he has learned it from THE MICROCOSM; and that he cannot tell on his own principles of reasoning why a pound-ball is harder to start into motion than an ounce ball, both equally balanced in vacuo. In all reason, don't we neutralize gravity as a mechanical force when we lift a stone, or throw a ball upward? Don't we neutralize or counteract the mechanical force of a flying ball when we catch it?]

(12.) And what has "gravity" to do with this? By the suspending string gravity is already "neutralized," or rather transformed into its motionless state of mere weight; and at the start, where the stroke and the motion is received, horizontal motion being at right angles to gravity, is not increased or lessened by it, according to one of the axioms of mechanics. It is true, that, *after* motion is produced, the suspension becomes oblique, and then gravity acts sufficiently to bring the ball gradually to rest; but this is gravity overcoming the motion after it is acquired; it is no *deduction* from the motion at the start; it does not even exist with a free-moving ball. Not only is the imparted motion all the overcoming of inertia there is, as we saw before, but also, there is no hindering gravity at the start, to be spuriously *called* inertia, as we now see. Gravity in friction may hinder a rolling ball, but it cannot hinder a ball revolving perpendicular to it.

[In his previous paragraph he ridiculed the idea of *neutralizing* gravity, and asks, "Where is conservation?" Here he admits that it is "already neutralized" "by the suspending string"! "Where is conservation," professor? Somebody is terribly confused. The rest of this paragraph is a proof of it. Let the reader understand it if he can.]

(13.) Nothing is to be overcome *before* a free body can start. On the contrary, when a body at rest is in perfect equilibrium and vacuum, or perfectly free to move in any direction, the slightest force imaginable will move it, though it may be so slightly as to be imperceptible, if the mass be large. For, there is nothing to be overcome but the lack of motion—the *motionlessness* of the body. If,

with total force (or ball) 2, it took force 1 to overcome inertia, leaving only force 1 to produce motion 1, then, with total force (or ball) 4, the same force 1 being lost, the remaining force 3 would produce motion 3; and we should thus have *thrice the motion to twice the force!* Such absurd notions concerning *inertia* are quite prevalent; and I had occasion to correct them last year, even in so able a work as the "British Review."

[Still more *fog*, and London fog at that. "*Nothing is to be overcome before a free body can start.*" Yet in paragraph 10 he says, "The moving of a mass is the *overcoming of its inertia.*" He first says there is "nothing" to be overcome, and then speaks of the "*overcoming of inertia!*" Is *inertia* "nothing"? Then he says in this 13th paragraph that the "*slightest force*" will move a body in vacuo! Ah, indeed! why does it require "force," when "*nothing is to be overcome*"? If any one possesses a fog extinguisher he may be able to comprehend the last part of this paragraph. We do not enjoy the advantages of such an apparatus.]

(14.) Moreover, at page 246 we are told: "Each added ball is bodily displaced to the extent of its elastic indentation, and *thus consumes some of the original force in overcoming its static inertia.*" Here the actual motion acquired by each successive mass is rightly treated as the overcoming of its inertia,—an improvement on the other extracts given; and the error here is in confining this to "some" of the force imparted. Whereas, the truth is, the acquired force *as a whole* goes *as motion* or momentum into each mass successively; but it is immediately transferred again to the next mass, before the motion goes beyond the indentation. If only "some" of the force causes the ball to be "bodily displaced," pray, how does "the remainder" of the force get over to the next ball, without producing motion at all? And has not the objector himself told us, that this very "remainder" of the force, not spent "in overcoming the static inertia," is what "goes into motion" of the mass? Thus he does really make the whole force rightly produce motion of each mass, to be transferred over *immediately* to the next mass.

[A few sentences will, we trust, relieve the Professor of his confusion of ideas in this paragraph. The mechanical force of the striking ball all goes into the row, and it all first causes motion either molecular as in the indentation of the ivory, or as in the bodily displacement of the balls. Besides these motions, there is a molecular pulse or disturbance of atoms throughout the entire mass of each ball constituting the row moved, as proved by a pulse going through a solid glass rod several feet long, as shown last month by one of our experiments. Now it is all plain; a small fraction of the force of the striking ball makes the first indentation; one-half this fraction is lost or converted into heat by molecular friction, as shown incontrovertibly by our newly discovered law last month. The other half of the force which caused this indentation is sent forward by its reaction to help indent the next ball, and so on, each indentation losing by its formation, and by the act of recovering one-half of the mechanical force which was required to produce it, till finally, when the force has travelled through a row of only twenty or thirty balls, more or less, it has one-half been lost or consumed as mechanical energy by thus encountering molecular friction, and by being converted into heat or other form of force. The practical consequence is that the far ball in the row receives only the force left over from this mechanical work of indentation, friction, displacement, etc., and moves away, not as far as the

striking ball fell, as Prof. Goodenow positively asserted in his March article, but a distance proportioned exactly to the amount of force remaining over after the mechanical work thus named has been done. Is there any *fog* about this? And does it not appeal to the common sense of the reader as true science? If Prof. Goodenow's teachings were correct, it is plain that the farther ball in the row, instead of being driven away a distance less than the striking ball fell, as experiment shows, it should absolutely go *twice as far*, since, according to his view, no force is lost by the indentation or overcoming of inertia, and since "*elasticity doubles the force imparted,*" and since the striking ball "*imparts all its force!*" Was ever anything clearer?]

(15.) But we are further told, at this same page 246, that "Each ball added to the suspended row *must deduct something from the motion of the last ball,*" because, when two suspended balls keep striking each other back and forth, they will keep losing motion till they come to rest "in about twenty seconds,"—though the first ball thus swinging back and forth without striking anything, "will continue to swing through fully one-third of its first motion for more than one hundred and twenty seconds."

(16.) There are *three* explanations of the short time occupied by the two balls in striking each other: (1) No balls are *perfectly elastic*; and it is only to such balls (abstractly conceived of) that the transfer of *all* force applies. (2) Balls do not always *strike exactly fair*, or in line with their centres of gravity; so that there is often a slight motion left in the striking ball, causing the next blow to come too soon or too late for the full effect. Especially is this the case if the suspending cords be short. The experimenter should have told us his length of suspension, and also his size of ball, and his amount of original stroke. (3) If *heat* is generated in the stroke, that will indeed reduce the moving force a little each time. But this must be very slight; and if it reduces *distance reached* a trifle, still it need not affect the *velocity of transfer*, as we shall see.

[In trying to account for the great difference in time between one ball swinging alone (120 seconds) and two balls swinging and alternately striking each other (20 seconds), the Professor commits several errors. In the first place, the ivory or glass balls are perfectly elastic, according to our newly discovered law, as described last month, and the true definition growing out of that law, because any indentation made will entirely recover its original form. Previous to that discovery we had conceded that ivory and glass were *almost* perfectly elastic, but not entirely so. The fact that the striking ball, if it hits fair, will come entirely to rest, proves its perfect elasticity, as Prof. Goodenow admitted in his March article, as it gives up all of its force. If they do not hit fair, and thus strike irregularly after the first blow as he describes it, such blows, a little too soon or too late, will add just about as much to as they subtract from the alternate motions, and consequently could not perceptibly lessen the aggregate time the two balls would thus move compared to the motion of a single ball; much less could this factor make a difference of *five-sixths* of the time actually lost as we showed in our March editorial, and which Prof. Goodenow does not deny. Hence his single "if" about the "heat" possibly generated by the striking balls, presents the real cause of this loss of motion, and this heat is only the equivalent of the friction caused by the successive indentations and restorations; and the necessary loss of mechanical energy expended or consumed,

in successively overcoming the inertia of the ball at rest. This is manifestly what becomes of the *five-sixths* of the motion of the striking balls, since the single ball has none of this loss by indentation, molecular friction, etc., to consume its inertia of motion. Hence, as experiment proves, it moves *six times* as long, through a given distance, with only the same original mechanical impetus. How plain would all this have been to Prof. Goodenow had he seen, before writing, our new discoveries on the elastic transfer of force as given last month! He will henceforth be without excuse.]

(17.) The great truth reached in my last article was this: That, "if the masses are equal, the *whole* force goes from the striking body, leaving it at rest;" just as is now conceded by the objector. My deduction (now refused by him) was, that the struck body there upon "*takes all* the force, and goes off with the same motion as if it were the striking ball let drop." I uttered this last in general terms, as being to all practical purposes true. But I am willing to put in this trifling qualification just named, that if any *heat* is elicited in the stroke, that will deduct a trifle (not noticeable) from the force transferred and the distance reached, though not from the velocity of transfer.

[This correction of a gross fallacy is so grudgingly and stintedly done, that it had better not have been done at all. He calls it a "*trifling* qualification," and well he might. Look at our startling law announced last month, in which we demonstrated that with perfectly elastic air only one-half of the mechanical force which produces a compression can be utilized on another body for mechanical work in the act of restoration, and that one-half of the entire original force which he calls "a trifle, not noticeable," is thus necessarily lost in the resistance caused by molecular friction, and the heat thereby generated. Such a factor we admit has not been "noticeable" by scientific authorities heretofore, but they will notice it now.]

(18) A slight transformation of force into heat, if constantly repeated, will somewhat shorten the distance to which the transfer will reach, preventing the force, thus slowly diminished, from going on *indefinitely* to any number of balls, (so far correcting the general term used in my last;) and making its effect when diffused in air diminish a little more rapidly than as the square of the distance increases. But this differing value of the force and of the motion resulting (among the air particles), is only what gives greater or less *intensity* to the effect at different points. It need not affect the *rapidity* with which that effect is transferred to a distance; since that transfer is not attributed to the moving force, but to another cause (elastic action), which operates with constantly equal rapidity whether the moving force be great or small.

[Another grudgingly meted out "trifling qualification." The "slight transformation into heat," he now concedes, will "somewhat shorten the distance to which the transfer will reach," thus taking back his "indefinitely," his "any number of ivory balls," and his driving away of the farther ball "as if it were the ball let drop." It is high time he was about "so far correcting the general term used in my (his) last." But whenever he learns, as he no doubt has before this, that one entire half of the force of every indentation is lost in friction, heat, etc., we shall expect so candid a scientist to make more than this "trifling qualification." If he is anything near as frank as we believe him to be, as soon as he sees the bearing of our newly discovered law of elasticity he will publicly abandon entirely his

theory of the elastic transfer of force, and denounce the text books for having misled him.]

(19.) Any such transformation of the force into heat, if occurring in a jostled medium, such as air, may indeed increase the elasticity of that medium, and so make its transfer of the effect to a distance more rapid still, instead of its being made slower by the force changed to heat. And this is in fact alleged to be the case by acousticians, as accounting for the excessive rapidity of sound, though I am not here advocating that theory. It is at least doubtful, if enough of the force jostling the air is lost in heating it, to lessen to any great extent the distance to which that jostling will reach.

[This paragraph is highly interesting to us, as it cautiously hints at the theory of Laplace as now taught by Tyndall and all authorities, that one-sixth of the velocity of sound, or 174 feet in a second, is actually caused by the heat of the atmospheric condensations in sound-waves. But the Professor, after barely hinting at it, gently gives it up by concluding that not enough of the force which jostles the air, "is *lost in heating it* to lessen to any great extent the distance to which that jostling will reach." But lest he should be misunderstood as an advocate of the wave-theory, he discounts the inevitable future of science by adding—"though I am not here advocating that theory." He had better not. By the way, is it not strange that he should speak of *force* being "*lost in heating*" the air after so severely criticising us for using precisely the same term?]

(20.) The *chief* reason for the comparatively short time occupied by two suspended balls in striking each other, is given at number (2) above. If the two balls are suspended so as *just to touch*, then the striking ball has to go beyond its equilibrium, by the distance of indentation in both balls; and, consequently, after contact it has to swing back a little, and then return to meet the struck ball a little on its original side of equilibrium, thus receiving a little less than its full stroke, and therefore leading to a decrease of motion. If, on the other hand, the two balls be suspended so as to impinge by the total distance of indentation, then either ball in striking goes just to its equilibrium; but it thus strikes before attaining its full speed, and each time a less and less speed is imparted. There is no way to get near the exactness with suspended balls, unless the points of suspension be immensely high; and even then, fluctuations of the impeding air upon so long cords of suspension may mar the experiment.

[Apparently not satisfied with what he had said at paragraph 18, on the reason why two striking balls lose motion so rapidly, he goes back, and by the finest sort of calculations he adds another reason, which is substantially the reason he gave before, namely, irregularity of the balls hitting after the first blow, which, as we showed, is just as apt to help as to hinder continuance of motion. This whole fine spun reasoning is overturned by the simple fact that the struck ball at the very first blow will not go as far as the striking ball would have gone if unimpeded, thus demonstrating that some of the original force of the striking ball is lost in the first indentation and in overcoming the inertia of the ball at rest. Besides this, we have shown the Professor in our newly discovered law of last month, as reiterated in these paragraphic replies, the true cause of this rapid loss of motion in two striking balls, namely, the indisputable fact that no indentation can give back in recovering its form more than one-half the mechanical energy required in its

production. When this law is duly recognized, as it will be soon, all controversy must necessarily cease on the elastic transfer of force, and with this recognition must pass away forever the received theory of acoustics.]

(21.) My previous demonstration, therefore, stands unimpaired, namely, that there can be no possible reduction of force; that no inertia or gravity can diminish imparted motion; and that the transfer of force, at least through perfectly elastic air, may come *very nearly up to the full measure of decrease as the squared-distance-inverse*. I have now disposed of the first seven columns of that long arraignment in March, and further comment must wait till the editor can find room for it.

EAST MARSHFIELD, MASS.

[So ends the manifestly embarrassing effort of the professor to answer our positions in one sweeping declaration, that his "previous demonstration stands unimpaired"! Had he prudently left us to guess what he meant by that "previous demonstration," he might have retired with the doubtful satisfaction of befogging the reader and thus concealing from him the true fact that he had flatly contradicted himself in his last paragraph. But he unfortunately states the nature of his "demonstration," namely—"that there can be no possible reduction of force." Yet, as just shown in paragraph 19, he admits that a certain amount of the "force" which jostles air, "*is lost in heating it*;" and on account of this same *loss*, in the case of the row of ivory balls, he was compelled in paragraphs 17 and 18, to modify his former statements in regard to the transfer of force "indefinitely," or through "any number of ivory balls"! He also adds as a part of his demonstration which "stands unimpaired," "that no inertia or gravity can diminish imparted motion"! This is the worst thing yet. Fire a bullet at a suspended bag of sand, and does not the inertia of the sand-bag diminish the "imparted motion" of the bullet? If not, why does not the bullet carry the bag along with it without stopping, since Prof. Goodenow says the bag is free to move, and that "nothing is to be overcome before a free body can start," and that the "slightest force imaginable will move it." What but the inertia of the bag brings the bullet to rest? Throw a stone vertically upward, and does not *gravity* diminish the motion "imparted" to the stone? Yet he says that "no inertia or gravity can diminish imparted motion"! And this is the "*demonstration*" which "stands unimpaired." Strange that he did not add as a part of his "demonstration" the fact that "*elasticity doubles the force imparted from one mass to another*;" but that it does not double the force of the striking ball, only the "force imparted," though the striking ball "imparts all its force," etc., etc. Such a "precise statement" would have made the demonstration invincible! In all seriousness, if this kind of science disposes of our "first seven columns," what would it take to dispose of the remainder of that March editorial?]

PA. MIL. ACAD., May 6, 1884.

Editor of THE MICROCOSM :

DEAR SIR :—I have just read with pleasure of the possibility of Prof. Vail's great work, on the Annular Theory of the Earth, appearing in book form. Having had a lengthy correspondence with Prof. Vail upon his favorite theme, and having been favored by him with a multitude of explanations and additional points not touched upon in THE MICROCOSM, I wish to say that in my esti-

mation, no book is so much needed at present as his. With the exception of the *Problem of Human Life*, I most earnestly believe the work of Prof. Vail to contain the most startling, beautiful and thoroughly satisfactory religio-scientific discoveries ever presented to the human race, within a century. The light thrown upon every little detail of the first chapters of Genesis is simply astounding. The explanation of the figures there employed, the wonderful elucidation of the unsuspected literal force in many expressions, always supposed to be figurative even by the most conservative, and the marvelously complete reconciliation of true science with the Bible, are totally beyond the wildest attempt at imagination until the light has been obtained. Had I the means at my disposal I would gladly print the book and circulate it gratuitously by the thousand, that all who believe in God and in true science might know the wonderful truth. I do sincerely trust that every subscriber to THE MICROCOSM will send his name to Prof. Vail at Barnesville, Ohio, in order that the book may speedily see the light. I hereby notify the Professor to put me down for ten copies, which I will engage to dispose of if I have to turn bookagent to accomplish it. Every minister of the gospel should most earnestly strive to procure a copy. He will find it a feast of fat things. The first notice Prof. Vail will have of this letter will be obtained by reading it in THE MICROCOSM. May God speed the truth.

Yours as ever,

R. KELSO CARTER.

[Those wishing to catch a glimpse of the beautiful things that the book will contain, have only to turn to the back numbers of THE MICROCOSM, and re-read the startling details of the wonderful theory. By all means let each subscriber pledge himself for a copy.—EDITOR.]

RENEWALS FOR VOLUME FOUR.

Our subscribers will please take notice that the price of volume 4 of THE MICROCOSM will be for renewals invariably \$1. It ought to be \$1.50, to afford anything like living profit. This is the opinion of all candid patrons of this Magazine, considering the fact of the vast amount of *original matter* it presents every month—more in fact than any other journal now published. At its present price not one penny can be saved over expenses at the end of the year, even with our large subscription list. The Editor absolutely works for nothing year in and year out; and what is better, he asks nothing. Subscribers should not, therefore, in simple justice between man and man, think of deducting any percentage from the \$1, because they may heretofore have acted as agents; and received twenty-five cents discount on new subscribers. We still give this discount for clubs of *new* subscribers, or we will give the fourth copy one year free for a club of three new subscribers with \$3. Or we will give for three new subscribers (\$3) either of the following books as premiums:—*Universalism Against Itself*, *Walks and Words of Jesus*, *Retribution*, *Through the Prison to the Throne*, or *Death of Death*. Or for four new subscribers (\$4) the *Problem of Human Life* (cloth), or for five new subscribers (\$5) the *Problem* (leather), or volumes 1 and 2 of MICROCOSM bound together (cloth). These are our best terms during volume four. See life-subscription offer, and wholesale prices of books elsewhere.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

THE SUBSTANTIAL PHILOSOPHY.—No. 3.

BY A. WILFORD HALL.

[From the *Christian Quarterly Review*.]

After these reflections upon the analogy rationally existing between the sensations of smell and of hearing, we naturally came to consider that of *sight*, in its relation to the other senses, and to inquire as to the most reasonable or probable view of Nature concerning it. And in the first place, we aver here that there is not and never was the slightest show of plausibility or reason for the *undulatory theory of light*, and this truth is beginning to be suspected by eminent scientists both here and in Europe. The explanation of this growing impression is, that there is no foundation in reason or science for the assumed *luminiferous ether* on which that theory is based.

It is a matter of history that the undulatory theory of light originated in the fact that *Huygens* (or some say *Young*) became dissatisfied with the *material particles* in Newton's Emission Theory of light; and well he might become dissatisfied at so unreasonable and impracticable a supposition. Such a gross idea as that any *material particles*, however diminutive, could enter the eye at the enormous velocity of light, as Newton's theory taught, without injury to that delicate organ, is too absurd for patient consideration. But what did Huygens substitute for such material corpuscles? Did he make the discovery, here lying at the base of Substantialism, that particles of real substance might at the same time be incorporeal or immaterial, like rays of magnetism or gravitation, and thus enter the eye at any velocity without injury to the optic nerve? Not a bit of it, though such a discovery would have completely saved Newton's emission theory, and might have led ultimately to substantial sound-pulses, and to a harmonious reconciliation of the physical laws involved in the operations of all the five senses, instead of leaving them, as now taught in science, a jumble of incongruity and self-contradiction. No; Huygens, it appears, could grasp no such revolutionary idea; but, in order to improve upon Newton's material emission theory, he actually proceeded to invent an all-pervading *ether*, another but very attenuated, *material substance*, which, as Prof. Tyndall declares, has the properties of *matter* including *inertia*, and acts mechanically on the principle of a jelly! What, we ask in astonishment, did the great scientist Huygens want of this highly tenuous "jelly"? Why, he wanted something out of which to construct "*light-waves*" and thus makes light harmonize with the acknowledged undulatory nature and action of atmospheric *sound-waves* as another "*mode of motion*!" He actually reasoned thus: that it was not consistent, as he said, that sound should be merely the wave-motion of air, with the corresponding vibration of the ear-membrane, and that Nature should then jump abruptly to the emission of material corpuscles for the production of the next sensation above it, and we say to him—*thou reasonest well, Huygens!* Hence, he fabricated *ether*, an absolute creation out of nothing, to meet this condition of things, and thus produce the sensation of seeing by means of *ether-waves* and *retinal vibration*, as sound was produced by means of air-waves and tympanic vibration! This was certainly logical reasoning on his part *with sound then universally regarded as but air-waves*—the corpuscular idea of sound never having occurred to any one. But why could not Huygens have applied similar reasoning to the corpuscles of *odor* and the sense of smell, and thus logically

have led himself into the corpuscular theory of sound, leaving light where Newton had it, with the bare change of his impracticable material particles into incorporeal substance, as Substantialism now presents it? Plainly, had this happy thought of incorporeal substance struck that great scientist, the Substantial Philosophy might then have been established, and its present founder would probably have been spared the buffetings he has been subjected to by his unavoidable conflicts with incorrigible scientists. But it was not so to be. The world was not then ripe for such a radical and revolutionary departure in science, philosophy, and religion, and the absolute harmony of the three, as Substantialism has clearly inaugurated. Huygens thought he had made an important discovery and a vast improvement upon the emission-theory, and well might he think so, when the great Newton himself abandoned his material light-particles for what he supposed to be the less objectionable waves of this *jelly-ether*! This, we must say, without, however, disparaging that great philosopher, was one of the weakest things ever placed on record against the intellectual ability of Newton, since it only required the simple change to immaterial substance to make his emission theory correct, while it requires, according to *Tyndall on light*, and all modern science on the subject, "699,000,000,000,000" of these material *jelly*-waves to enter the eye and dash against the retina in one second of time in order to produce the sensation of violet light; thus actually and mechanically driving this optic membrane to and fro the same almost inconceivable number of times in a second! If the retina really takes the same place and fills the same office for light that the tympanic membrane fills for sound, being its mechanical congener, as science teaches, and as the undulatory theory of light must of necessity mean, if it means anything, then the retina must bend "once in and once out" as each of these ether-waves strikes it, for that is exactly what Prof. Tyndall says occurs with the drum-skin of the ear whenever an air-wave hits it, in producing the sensation of tone. Then suppose the retina moves only a very small distance, as each of these ether-waves dashes against it,—we care not how small—say, the *one-millionth* of an inch,—or less than the one ten-thousandth part of a hair's breadth; it must actually travel back and forth an aggregate distance of more than *ten thousand miles in a second* while we are looking at a violet light! What membrane, even if made of steel, could stand such wear as this? Yet without thinking of the cruelty involved, that great Dutch scientist Huygens deliberately proceeds to destroy the eyes of all mankind by shaking every retina to pieces in the necessary process of vibrating in synchronism to 699,000,000,000,000 material waves of ether! And all this he does as an act of kindness to Newton to keep him from putting out our eyes with his emissions of material light-corpuscles? But we may all thank Substantialism that we have our eyesight, and that we not only enjoy the light of the sun, but that we can bask also in the effulgent light of scientific truth.

In all seriousness, is it really possible that Huygens, or Young, or Newton, or Tyndall, or Helmholtz or any other man with a philosophical turn of mind, could believe in such stupendous folly as this bending of the retina in and out 699,000,000,000,000 times in a second, when the simple contact of incorporeal light-substance, without any waves about it, will answer every condition of optics, just as substantial corpuscles of fragrance explain every fact in odoriferous phenomena, and produce

effects in nasal sensations equally complex and mysterious with those of sight and hearing?

Our subsequent efforts at overturning the wave-theory of sound, after thus reaching the conclusion that light must be substantial, and that sound remained the only real obstacle or plausible barrier to the broad application of the Substantial Philosophy, are a matter of public record known and read of all men, and cannot be enumerated here. We take pleasure in referring all who may wish to satisfy themselves upon this subject to the *Problem of Human Life*, in which the original attack was made upon that theory, and in which the original foundation of Substantialism was laid. And although that work contains many minor errors on the novel scientific hypotheses then necessarily introduced for the first time, the whole discussion being entirely new to the writer as well as to the world, we still feel gratified to know that it so well outlined the scope and bearing of the Substantial Philosophy which has since been strongly and even invulnerably fortified and reinforced in the three successive volumes of *THE MICROCOSM*. In that magazine numerous arguments have been culminated against the current theory of sound both from our own pen, as editor, and from the able pens of our contributors, especially Capt. R. Kelso Carter, the critical Professor of higher mathematics in the Military Academy at Chester, Pa. We have only space to state here, very briefly, one out of scores of arguments against the current theory of sound that appear in the "*Problem*" and *THE MICROCOSM*.

This one argument, amounting to an absolute demonstration (to which we have the acknowledged credit of first calling public attention), is based upon the fact that the string of a musical instrument, or prong of a tuning-fork, instead of "swiftly advancing" in order to "carve the air into condensations and rarefactions" and thus send them off as sound-waves, as Tyndall, Helmholtz, and all authorities on acoustics teach, will really produce audible sound when traveling *thousands of times slower at its swiftest motion through the air than the hour hand of a common family clock*! In replying, in the October *MICROCOSM*, to Prof. Stahr, of the Franklin and Marshall College, at Lancaster, Pa., who violently attacked Substantialism in the *Reformed Quarterly Review*, making a strong point of the swift motion of the prong, we gave the first announcement of a new discovery we had made of a simple method of measuring the actual amplitude of the fork's swing while still sounding audibly, down to a distance of less than the *one sixteen-millionth of an inch*, or an aggregate velocity (counting the whole distance traveled both ways) of *less than at the rate of one inch in three hours*! This seemed incredible in the light of the wave-theory and the teachings of the greatest living scientists, which assure us that the prong must advance "swiftly," as it necessarily should do, in order to drive off condensed pulses of air at the velocity of sound (1120 feet per second), or in fact even to condense the air at all. We at once reported our discovery to Capt. Carter, who received the news with a shout of amazement and joy, and wrote us enthusiastically that owing to the imperfection of the tuning-fork we had used he believed that we had fallen 400 times short of the full value of our discovery, promising, at the same time, to proceed at once with accurate experiments to determine the real extent of the discovery by aid of his best Koenig instrument, and to report the same to *THE MICROCOSM*. That

astounding Report he sent to us, which we printed in the Dec. MICROCOSM, and being brief, as well as intensely interesting and instructive, since it totally annihilates the wave-theory, thereby raising the last pillar in the grand colonade of the temple of Substantialism, we feel we cannot do a better service to the reader than to reproduce it here:

CAPT. CARTER'S REPORT.

DEAR DR. HALL:—According to my promise, as printed in the November MICROCOSM, I now proceed to give you my report of experiments on the slow motion of a tuning-fork's prongs, in confirmation of your "finishing demonstration" as given in reply to Prof. Stahr, in the October MICROCOSM. The following are the results of my experiments:

I used a large Koenig fork of 256 vibrations. Striking it heavily and holding it upright in my fingers, I found that its sound was clearly audible (either held to the ear or through a long rubber tube,) at the end of *four minutes*. By means of a finely graduated scale I easily measured the amplitude of the fork's swing. I found it to be at first 4-60 (1-15) of an inch. At the end of fifteen seconds it had reduced to 1-60 of an inch amplitude. At the end of fifteen seconds more, its motion was barely visible against the sky. Now I can easily see a line of 1-240 of an inch in breadth, which proves that the amplitude had again diminished to one-fourth. In the third fifteen seconds, the motion had become totally invisible, even through a good magnifier. Safe to assume another fourth, or a reduction of amplitude to 1-960 of an inch for each swing.

Now there are sixteen times fifteen seconds in four minutes, hence I have the 1-15 of an inch swing reduced by four as a divisor, sixteen times, or in round numbers to 1-64,000,000,000 of an inch at each swing. As the prong swings through this amplitude, counting both directions, 512 times in a second, we have the entire distance the prong travels, while still sounding audibly, but the 1-123,000,000 of an inch in a second. There are in round numbers 31,500,000 seconds in a year. Hence the prong moves at the rate of only about *one inch in four years!* Allowing one-half for the swifter travel of the prong at the centre as compared with its average travel throughout a swing, and we have the astounding fact that the fork continues to produce audible sound, *while its prongs, at their swiftest motion, are not traveling at a velocity of more than one inch in two years!* As your demonstration only brought down the prong's swiftest travel while still sounding to *one inch in three hours*, I have, therefore, made the proof more than 5,000 times stronger against the wave-theory than you had it, instead of 400 times, as I promised last month. Let physicists dispose of these figures if they can, or forever after hold their peace.

Yours for the truth,

R. KELSO CARTER.

Thus expires the wave-theory of sound, crushed utterly by this single demonstration if not another argument could be brought against it, leaving acoustical science as well as modern physicists all at sea without chart or compass. Plainly, if a sounding fork radiates audible sound-pulses while the prong is moving only at a velocity of *one inch in two years*, or even *one inch in an hour*, common sense tells any man who has the capacity to think, that no condensed pulse of the air can be generated, much less sent off at a velocity of 1120 feet in a second by such almost inconceivably slow motion. We cannot be mistaken in this. Hence, the irresistible conclusion is, and one which every

philosophical mind must accept, that sound does not consist of air-waves or atmospheric pulses at all, and consequently that the present theory of acoustics is totally false, and that all our colleges and all professors of physics throughout the world are now engaged in teaching the grossest scientific error on this subject in place of truth.

But since no wave-motion or any other motion of the air can constitute sound, or explain away the above-named fact, whatever the incidental appearances of atmospheric tremor near the instrument may be (which we have repeatedly explained in THE MICROCOSM), the final conclusion of the whole matter is summed up thus: that sound must be an *incorporeal substance* generated by the molecular motion of the sounding instrument, and radiated through air and through other media by a law of conduction somewhat analogous to that governing electric discharges, and suited by the Author of Nature to the molecular structure of such media, as electricity is suited to its velocity and mode of conduction. We are forced to this substantial conclusion since, with the wave-theory gone and forever out of the way, there is no middle position that can be assumed as ground to stand upon between *motion* and *substance*. We have urged scientists to guess or imagine any other position that can be assumed as a middle ground between the two. That which passes from the distant sounding instrument, reaching the ear after a certain interval of time has elapsed, and which produces the sensation of tone, must be *something* that actually travels. As it cannot, by absolute demonstration, be air-pulses or atmospheric undulations, there is nothing within the reach of human imagination left for it to be save pulses of immaterial substance. Thus Substantialism, reaching out her entitative arms, takes lovingly within her maternal embrace the last erratic but most obstinate child of Nature, compelling it to kiss the cross and become reconciled to the claims of the New Philosophy.

The frame-work of Substantialism thus scientifically mortised together and erected, nothing remained for its founder and friends but to fill in the skeleton edifice with the substantial concomitants in the shape of facts and analogies from Nature necessary to complete in fair proportion this temple of scientific and religious truth, which now rears its stately dome midway over the very centre of the chasm that separates the here from the hereafter. This work of filling in, strengthening, and beautifying, they are now accomplishing satisfactorily, and with results encouraging beyond their most sanguine hopes. Every new investigation in natural philosophy, or new discovery in acoustical science tends to furnish additional corroborative evidence in support of the great central truth of Substantialism, and to confirm the doctrine that every force of Nature and every thing in Nature, visible and invisible, which can produce a manifestation or form the basis of a positive concept, must be substantial, from the self-manifest and primordial Author of Nature down to the magnetic force of a grain of load-stone, or the vital energy of a crawling worm.

But the Substantial Philosophy is by no means limited in its scope and bearing to a proper grasp of the physical forces of Nature, nor to a correct conception of the vital and mental manifestations in material organisms. It sees in and beyond every substantial force which apparently moves of itself or affects physical bodies, a source and fountain of intelligent power from which such active force must have derived its energy and its laws of motion. The gravity of a whole world could not act upon a pebble so as to

cause it to fall only as that substantial force proceeds under law from the fountain of all force, and is thus the energy of God immanent in that force. Neither electricity, nor light, nor heat could radiate or travel a single inch of itself, but only as God says to it, as He does to the sea,—thus far shalt thou go, and thus swiftly shalt thou travel.

So also Substantialism sees in every living animal that breathes, from man down to the moneron, the presence and intelligent moving power of the God of Nature. No animal consists chiefly or principally of its mere corporeal structure. Within that material organism is another structure far beyond the present ken of man,—a vital or mental organism, constituted of an original atom from out the primordial and self-existent fountain of all being and all existences. Without this incorporeal organism which pervades the physical structure, no animal could ever grow, and no specific distinction in races could be maintained in Nature. That vital and mental organism, being the exact specific counterpart of the corporeal form and structure, constitutes the outline-pattern complete in each animal for its growth or development, from the earliest embryonic start, yea, from the very ovule or life-germ, by which the bioplasts are enabled to work under the laws of growth, in the deposition of assimilated food, filling out the specific structure to the smallest minutia of nerve and the minutest tissue of muscle without making a single mistake. This vital and mental substance, constituting such incorporeal organisms in the lower animals, serves its purpose in the economy of Nature whenever these organic forms shall have dissolved at death. It then falls back, as we have already had occasion to intimate, into the great fountain of vitality and lower mentality constituting a part of the exterior being of God, and from which all animal existences with their mental powers originally emanated as mere atoms. But man, as the head and representative of the animal kingdom, forms, as Substantialism teaches, the connecting link that unites this earthly life-system with the incorporeal realm of life and spirit-consciousness beyond. Hence, in addition to the vital and mental organism within the corporeal structure as possessed by lower animals, he has been endowed also with a spirit-entity, a self-conscious ego which identifies him with two worlds and makes him a self-investigating personality and a titled heir to an immortal existence; and having been made in the image of God, he intuitively recognizes God in his consciousness. Endowed thus with a spiritual and moral intellectuality in addition to all the faculties that the most gifted of the lower animals possess, he is thereby capable of contemplating a future state of conscious being, and even of enjoying it by anticipation; and this very capacity, with the schooling of individuality that it gives to him here, and the longing hope that it constantly inspires within him, constitutes his *magna charta* to an immortal existence and a title-deed to a house not made with hands eternal in the heavens.

The view thus presented necessarily allies man to his Creator in a sense infinitely higher than that which reaches down to the lower animals. God, however, according to Substantialism, though essentially a Spirit as to His highest nature, also embraced originally within His exterior being all the life and mind now constituting the animal universe, as well as all the physical forces of Nature, which, as just remarked, can only operate as they proceed from and are moved by Him, and as they are intelligently manipulated through His established laws. From these original and sub-

stantial elements and forces, constituting from eternity the body and clothing, so to speak, of the infinite, intelligent, and self-existent Spirit, He primordially created matter and all the material worlds. This view the Substantial Philosophy holds to be far preferable to attempting to accept the unthinkable dogma of the creation of matter out of nothing; and thus, while forming, as it does, a consistent chain of philosophical thought throughout, it completely harmonizes Nature with the sacred record, making all things "*of Him*," as having been created out of the invisible things "*of Him*," or out of those things which do not appear.

Such a comprehensive Philosophy, which includes no dogma not consonant with man's reason, or which conflicts with his intuitions of the fitness of things, is most satisfying to the expanded powers of man's intellect and the cravings of the human soul. It points its philosophical index-finger beyond the chasm of death to another realm of existence as real and entitative as is the present, with real homes and mansions, and with real environments and associations, as substantial as are the material homes we now occupy.

The whole tenor of the New Testament teaches the religious aspect of this Philosophy in various poetical hints and allegorical expressions. The beautiful imagery of the inspired writers in portraying the residences of the spirits of just men made perfect, in the City of God, having gold for its street-pavements, and pearls and precious stones for its gates and foundation walls, with rivers of living water eternally flowing, with perennial trees on either side of these rivers bearing medicinal leaves, fadeless flowers, and imperishable fruits, are all figurative ideas and expressions in strict harmony with the Substantial Philosophy, which gently but firmly forces science and religion to meet half way on neutral ground and clasp hands in unity of spirit and in the bonds of peace. Indeed, while scientific Substantialism seeks to harmonize all the facts and philosophical truths in Nature with themselves and with the central truths of a Scriptural religious philosophy, it is at the same time entirely consistent with the belief that in another life, surrounded with spiritual environments, there shall be real flower-gardens, and fruit-groves, and immortalized feathered songsters, endowed with celestial musical powers, amid the most enchanting natural scenery and even set off with displays of spiritual art and architecture that will as much surpass the grandeur and beauty of the scenery and music and works of art on earth, as man with all his mighty intellectual powers surpasses the lifeless clod.

Religious Substantialism, though not under that name, is as old as the New Testament, and has ever since the Apostles' time been recognized by leading ecclesiastical and theological lights as the essential doctrine of the future life. But it remained for Scientific Substantialism, when the fulness of time was come, to grapple with the laws, forces and facts of Nature and evolve therefrom through correct principles of scientific ratiocination and the overthrow of false theories, a System of Philosophy that would newly bind the Book of Nature and the Book of Revelation in one cover of eternal parchment, stamped in living letters of illuminated gold upon the back,—GOD'S TEXT-BOOK—VOLUMES 1 AND 2!

☞ One more number (July) completes this volume. See notice of volume 4 elsewhere. Let every subscriber resolve to do what he can to extend our circulation for the opening of the new year.

PROF. COMSTOCK CONCLUDED.

The most important thing Prof. Comstock has ever written, next to his revelations on elasticity and force as quoted and examined last month, is his attempted grappling with our "finishing demonstration" as carried out in Capt. Carter's Report, by which the prong of a tuning-fork was shown to produce audible sound when traveling at its swiftest velocity only at a rate of *one inch in two years*, or a distance of the $\frac{1}{35,447,387}$ of an inch in a second. We say this is the next most important thing we have seen from his pen, because in attempting to meet it he totally evades the whole argument and ignores the force of the demonstration, switching off upon a matter not germane to the experiment or having anything whatever to do with it, thus leaving it by admitting its facts, in its undiminished force against the wave-theory; and he finally winds up by a pretense of quoting authorities to sustain him, one of which clearly confirms our demonstrated overthrow of the wave-theory, while the other is upon an entirely different subject having nothing to do with our present discussion. We make these prefatory remarks, that the reader may be put upon the alert to watch while reading his argument and noting his confused figures. We now give his entire article verbatim on that branch of the subject before further remarks:

"I should be glad to discuss the different subjects named by Dr. Hall, but a few remarks upon one of them must suffice for the present. At the close of his reply I find the following paragraph: 'We will add that we trust the students of Knox College will force Prof. Comstock to examine Capt. Carter's Report in the Dec. MICROCOSM, and then compel him to show his hand by either admitting its truth or attempting to expose its fallacy.' In response I would say that Prof. Comstock is on terms of good understanding with the students of Knox College in respect to THE MICROCOSM, and that when compelled to 'show his hand' concerning 'the locust,' 'Capt. Carter's Report,' etc., he will be likely to proceed about as follows:

1. Supposing the number of double vibrations, caused by the locust, to be 440 per second, the length of each wave would be $\frac{38}{100}$ feet, and taking half this as the thickness of the shell of air in which the particles are advancing, we have $\frac{19}{100}$ feet for the thickness of the shell required to be put in motion by a single impulse of the locust. The weight of a spherical shell of air which has a thickness of $\frac{19}{100}$ feet, and a radius equal to a mile is about 35,447,387 pounds.

2. Capt. Carter has shown us by direct experiment, (see Dec. Mic.) and we are much obliged to him for doing so, that a tuning-fork gives forth audible sounds, when the velocity of its prongs is not more than $\frac{1}{35,447,387}$ of an inch or $\frac{1}{35,447,387}$ of a foot per second. Now, according to Dr. Hall, (see P. H. L. page 90.) the velocity of the air particles cannot be greater than that of the moving prongs which impel them"; so if we assume this to be the velocity of the most rapidly advancing particles of air in the shell under consideration, it probably would not be much amiss to take half the amazingly small fraction as the average velocity of all the advancing particles in one shell.

3. Multiplying the weight of the mass to be moved, 35,447,387 pounds, by the average velocity $\frac{1}{35,447,387}$ feet per second, we obtain about .012 foot pounds per second, that is to say, the momentum to be given the mass would move .012 of a pound one foot in a second, or .192 of an ounce a foot in a second, or an ounce 2.3 inches in a second. This is not an unreasonable amount of force to ex-

pect of "the locust," for even Dr. Hall himself intimates that his formidable insect could "kick" an ounce ball, against another ball, as much as an eighth or a quarter of an inch, so as to make a "click." Moreover, it is quite probable that the pitch of the sound is at least two octaves above that upon which our computation is based. This would give 1760 vibrations per second, and would reduce the force to what would move an ounce six-tenths of an inch in a second.

4. Presuming 440 as the number of vibrations per second, if the locust were to exert the force, obtained by our calculation, 440 times in a second; until the first impulse had extended outward to the distance of a mile, the whole sphere of air would be vibrating in 2074 concentric shells the particles of air in half of each shell moving from the centre, and in the other half towards the centre. These results effectually dispose of the astonishing numbers connected with the history of this locust as given in the *Problem of Human Life*.

"But," Professor, "what do you say of Capt. Carter's claim that his experiment with the tuning fork overthrows the wave-theory of sound?" I say that the claim is nonsense.

Expositors of the wave-theory do not hold that the vibrating body which produces a sound, must necessarily move with great velocity. For example, Prof. O. N. Rood, a distinguished advocate of the wave-theory, says (see Johnson's Cyclopaedia Acoustics:) "Now the rapidity of the propagation of the tremor through the elastic medium is, for all tremors producing the sensation of sound, vastly greater than the velocity of the vibrating body; and this velocity of propagation is uniform, although the velocities of the particles of the medium which successively take up the tremor, diminish with the increased distance from the origin, because of the diffusion of the force through an increasing number of particles. If the limb of a tuning-fork make 500 double vibrations per second, the velocity of propagation will exceed the mean velocity of vibration more than 240 times."

Again W. H. C. Bartlett, Prof. of Nat. Philosophy at West Point for many years, says (see Bartlett's Optics, p. 25): "The wave is but a form occurring in the regular lapse of time, at places more and more remote from the place of the first agitation, while the particles whose relative positions determine the form, never depart from their places of relative rest, but by distances which are quite insignificant in comparison with the length of the waves." Testimony of like character might be cited to almost any extent showing by overwhelming evidence that the supporters of the wave-theory agree with Capt. Carter and Dr. Hall in the opinion that the velocity of the vibrating body need not be great. I have taught for many years that the number of inches moved in a second by the vibrating limb of a common tuning-fork is very small, especially toward the close of the audible sound."

REMARKS ON THE FOREGOING.

The reader is no doubt struck at the nonchalant coolness with which Prof. Comstock after admitting the facts of Capt. Carter's Report and thanking him for the experiment, dodges away from its crushing effects upon the wave-theory in hopes, as it unavoidable appears, of diverting the reader's attention from the fatal result of that experiment to a matter wholly irrelevant. But the Professor is hereby notified that the readers of THE MICROCOSM are not so easily as he imagines started off

on a false scent at the beck of any Professor of physics, whatever, the students in his class-room may be in the habit of doing. Our readers have been too long accustomed to see things sifted, and have too often had their minds riveted right down to the point in dispute to be lured from the track of an elephant to follow that of an Opossum. Let us brush aside the ink-darkened waters from behind this cuttle-fish argument and keep firmly to the trail.

After admitting the prong to move only at a velocity of the $\frac{1}{1200000}$ of an inch in a second, while still producing audible sound-pulses, he never stops to say one word about the self-evident impossibility of such slow motion compressing the air and sending off "atmospheric condensations and rarefactions," which alone constitute sound-waves according to his theory. No, not one syllable does he utter on this, which he knew to be the central point and in fact the only point of the experiment, and the very thing that the demonstration was intended to establish! Dare Prof. Comstock aver his candor in attempting to meet the force of Capt. Carter's Report, while thus totally neglecting even to refer to its only object, namely, to demonstrate that a prong moving 25,000 times slower than the hour-hand of a clock, cannot possibly condense the air, much less send off air-pulses, at a velocity of 1,120 feet in a second? If he were a conscientious lover of scientific truth, why did he neglect to refer to this only object or purport of the demonstration after stating the facts and figures of the experiment and accepting them as correct? And after thus entirely ignoring the object and intent of the demonstration, the facts of which he admits, what hardihood to assert that its claimed overthrow of the wave-theory "is nonsense!" Before asserting it to be "nonsense," would it not have shown the element of candor to have stated in a brief sentence his belief, that a body moving enormously slower than the hour-hand of a clock can actually condense the air, and thus let his students know what it is that he so flippantly pronounces "nonsense?" For plainly if such velocity (which he positively accepts by admitting Capt. Carter's experiment) will not condense the air at all, or send off waves 1,120 feet in a second, then Prof. Comstock knows that so far from being "nonsense," not a vestige of the wave-theory can exist in the face of that fact. Yet after pronouncing the claim "nonsense" he did not dare to tell what the claim was or even to allude to it, lest his students should see through his transparent helplessness.

The youngest member of the philosophy class in Knox College knows that if he moves any object, like a fan, through the air at a velocity, say of one foot in a second, no condensation of the air takes place in front of it, and no atmospheric pulse can possibly be sent off by such slow motion. He knows that instead of a pulse being driven away, the mobile air simply circulates around the moving fan from in front taking its place behind, thus restoring the equilibrium. Prof. French of Urbana (O.) University, and Prof. Stahr of Franklin and Marshall College, Lancaster, Pa., both conceded this as the record in THE MICROCOSM shows. Why did they voluntarily concede this? Simply because they then supposed that the prong at its swiftest point of travel moved much faster than a foot a second, as our "finishing demonstration," with Capt. Carter's Report confirming it, had not yet been published.

Prof. Comstock, if squarely confronted by one of his students, would not dare to deny that admission of his brother Professors. Then if a fan, moving a foot in a second, only displaces the air,

it is plain that two such motions, at no greater velocity, reduced half the distance, would do no more. If two such motions six inches each in a second would not send off condensed pulses, then manifestly reducing their distance to a sixteenth of an inch each and retaining the same velocity of motion, would no more tend to compress the air, of course! And if these would not send off pulses, but merely displace the air, then 256 such short motions in a second, each at the same rate of velocity (*one foot in a second*) would do no more! Is not this self-evident to any mind capable of reasoning philosophically? Now comes Capt. Carter's experiment, which Prof. Comstock admits to be correct, in point of fact, and which proves the distance of the prong's aggregate travel while still sounding to be such that its actual velocity is 200,000,000 times slower than the fan's motion at one foot in a second, which confessedly as we have seen, could not compress the mobile air at all! Yet Prof. Comstock, while conceding the facts of that experiment to be correct and thanking the Captain for demonstrating it, declares it to be "nonsense" that such a state of facts overturns the wave-theory!

We do not like to press a man unfeelingly who is already on the mental rack, and we would not do it in Prof. Comstock's case except that tens of thousands besides himself are interested in the result of this discussion; and hence the truth must be focussed in these pages as by a concentrated hundred-gun battery of Gatlings, even if scores of professors of physics have to be sacrificed thereby. We therefore repeat it, insist upon it, and emphasize it, that Professor Comstock *well knew* if he should even refer to the object or intent of the demonstration and experiment, instead of dodging away on an entirely different tack, that he would have had to surrender the wave-theory as a self-evident fallacy of science. But although he knew this, did he suppose for a moment that such a weak attempt to evade the consequences on his own part could deceive us or divert any watchful pen from exposing the trick? If he labored under such a delusion we hereby publicly undeceive him.

Now why does he go off a mile from the locust and in a string of figures attempt to show how little force that outside shell of air weighing "35-447,387 pounds" would require to move it by comparing its trifling vibration with the small distance the prong moves in Capt. Carter's experiment? There were two reasons for this adventure; the first and chief one was to escape saying anything about the real import of the experiment, and the second was to show by the small vibration of the prong that the air would have to move only an equally small distance, and would therefore require but little effort on the part of the locust to move it. As he knew positively that the Captain's experiment was intended to show that sound did not and could not consist of air-motion at all, why did he assume the very thing he should first have proved by meeting the demonstration, namely, that the air is stirred a mile or even a foot away from the locust? Then how weak in trying to show that if the weighty mass of air is moved but a very small distance it tends greatly to save the strength of the locust? This is another exhibition of the same deficiency in reasoning power which we pointed out last month in his wholly overlooking the *static inertia* of the 20,000,000 tons of air, or the friction of countless millions of indentations which the insect is obliged to overcome and produce, whether it moves the mass a quarter of an inch or the hundred millionth of a hair's breadth. Of course Professor

Comstock took no account of this inertia factor, or of these indentations, and therefore all his figures in regard to the slight labor the locust must have to perform fall in a pile of rubbish and are swept by the board. The locust by its strength alone, has to change this enormous mass of suspended matter from an actual state of rest to a state of motion, and *vice versa*, as the Professor admits, 440 times a second, and so far as overcoming the inertia of the mass is concerned, as before intimated, it matters nothing whether the mass is displaced the tenth or the ten-millionth of an inch.

But this whole evasion, as before remarked, was chiefly an effort on the part of the Professor to keep out of sight and thus avoid the fatal consequences of saying a word in regard to the true meaning and necessary effect of Capt. Carter's reported experiment. The only question in regard to that Report is, will a prong traveling at as slow a speed as the Captain demonstrates, and as Prof. Comstock now admits, condense the air? That is the question from which the unfortunate Professor seeks to hide, but from which he cannot be allowed to escape. He must meet it, or he goes down to be hopelessly covered up in the ruins of the wave-theory. We again call upon the students of Knox College, with whom the Professor claims to be on amicable terms, to put the scientific thumb-screws on him at once and make him wince till he will cry out—"men and brethren what shall I do?" Come, Professor, make the frank confession which you know in your soul to be the truth, and we will see that the thumb-screws are taken off, and we will send the news to fifty thousand readers of *THE MICROCOSM* free of charge. If you do so, you will have a clear conscience, and your students as well as the rest of mankind will respect you.

A word now in reference to the authorities quoted by the Professor, and what they were quoted to prove. His object in quoting them was plainly, as he says, to show that they admit the prong to travel much slower than the sound-pulse which no one questions, and he really does find one—Prof. Rood, in Johnson's Cyclopaedia—who admits that the prong moves only the $\frac{1}{10}$ as fast as the sound—that is 4 feet 8 inches, or 56 inches in a second! Yet Prof. Comstock parades this as *slow motion* and as an offset to Capt. Carter's experiment! But 56 inches in a second is comparatively very swift motion, as it is just 6,888,000,000 times swifter than our demonstration proves the prong actually to travel, while still producing audible sound, as Capt. Carter's experiment shows. What scientific effrontery, then, to array this authority with his 56 inches in a second, against Capt. Carter's demonstration of a velocity at the rate of only *one inch in two years*! No, Professor, this search for authorities might as well be stopped, when Helmholtz the highest living authority says, the prong moves "very much faster" than a clock-pendulum, and when Tyndall's brilliant imagination sent it "*swiftly advancing*" cutting and "carving the air into condensations and rarefactions," at the now demonstrated velocity of *only one inch in two years*!

The last authority of Prof. Comstock, namely, Prof. Bartlett, of West Point, never so much as mentions the tuning-fork, has no reference to it, and is only speaking about so-called *wave lengths*. Yet so hard pressed is the Knox College Professor, that he adds—"Testimony of like character(!) might be cited to almost any extent, showing by overwhelming evidence that the supporters of the wave-theory agree with Capt. Carter," etc.!!! As the last and most pitiable phase of this carica-

ture on argument, the Professor adds: "I have taught for many years, that the *number of inches moved in a second* by the vibrating limb of a tuning-fork is very small, especially toward the close of the audible sound"! But did he ever teach that "*the number of inches moved in a second*" was only *one inch in two years*? That's the question before the house. Whether or not he ever taught it before, he teaches it now, as he surrenders to the truth of Capt. Carter's Report, and thereby virtually abandons the wave-theory; so we will have to let him off.

THE PHILOSOPHY OF A CREATIVE BEING OR FIRST CAUSE.

BY PRESIDENT J. M. SPANGLER.

PROPOSITION:—*There is a First Cause, a creative power in this universe that has existed forever.*—For if there was a time when this First Cause did not exist, then the cause of all existence came from non-existence, and the whole universe as well as the creative power of the universe, came from nothing, which is absurd. Therefore, the First Cause has existed forever.

COROLLARY.—1. *All the attributes of the First Cause have existed forever.* An attribute is an essential property inherent in a person or thing. To suppose a First Cause could create the essentials to its own existence, is to suppose that it acted before it existed, and that something that had no existence created its own properties from non-existence or nothing, which is also absurd.

COROLLARY.—2. *The attributes of this First Cause are unlimited.* For to suppose that they are limited by any cause whatever, is to suppose another cause producing the limitation equal to or greater than the First Cause; but as this is the First Cause of *all things*, no other such cause is admissible, for in that case the created would be equal to or greater than the Creator, which is not rational.

COROLLARY.—3. *The First Cause, or the Creative Being exists everywhere.* If He does not exist everywhere, the same as anywhere, then there is another cause equal to or greater than Himself, by which His presence is limited, which cannot be as just shown.

COROLLARY.—4. *This Being is without form or parts.* For to suppose that He has either form or parts, is to suppose Him limited by such form and parts, which cannot be as shown above.

COROLLARY.—5. *This Being does not consist of a whole.* A whole is an aggregate of parts and implies divisibility and limitation, which cannot be, as already shown.

REMARKS. This may look like *reductio ad absurdum*. God has no parts, does not exist as a whole, is unorganized, and consequently as some will conclude, does not exist at all. The explanation is that God is a Spirit—an "intangible, incorporeal entity,"—too far beyond the limited powers of man to become a subject of his analysis. If we cannot tell the shape and form of electricity, sound, light, gravity, and other incorporeal substances, if indeed we can at all limit them by such terms, or even in their extension, why is it absurd to think of God as such a Being as described above? Why should not such a First Cause be capable of loving, thinking, planning, hearing, seeing, etc., as well as electricity and gravity are capable of "*acting*?" If the unorganized, indefinable, magnetic rays of the horse-shoe magnet are capable of overcoming the laws of gravity and actually lifting a weight of iron, why should it be thought incredible that an unorganized God should be capable of organiz-

ing and directing a universe? Is it not infinitely grander, more satisfactory and ennobling to the human mind to think of such a God, than to think of one limited to the form of the human body, with head, eyes, ears, heart, and *other parts* belonging to such a form?

AMERICAN COLLEGE, Concepcion, Chili, S. A.

REMARKS ON THE FOREGOING.

We have no objection to printing President Spangler's article for the consideration of our readers, though it controverts, in a measure, our own views, as frequently expressed in this Magazine. In the first place, supposing his positions to be correct, what possible advantage, as a religious tenet, can that view have over the opposite view, namely, that God is a veritable and substantial personality, with a body and parts as literally and truly as was possessed by Christ, who was the "express image of His person," and who was *very God*, as all Trinitarian and evangelical Christians believe? While God thus walked through Judea, was He any the less omnipresent in his omniscient and omnipotent attributes? Does President Spangler doubt the actual Godship of "Emmanuel—God with us"? and if not, does he doubt Christ's actual spiritual presence in Damascus, as the incarnate God of Nature, while he was personally riding into Jerusalem on the foal of an ass? Really, to assert that God cannot be possessed of bodily form and an actual personality, while His substantial but spiritual being pervades immensity of space, would seem to us to limit the Holy one of Israel vastly more than to deny the possibility of His presence every where in the same personal sense. Such a personal being actually located and enthroned in one part of His universe, with a real but incorporeal body, how large no one need care, could readily be supposed to possess attributes extending through all extent, thus constituting His omnipresence by which He could see and know and govern all that transpires just as a finite teacher sees and knows and controls all that transpires in his school-room while he is personally seated behind his desk. Such an infinite personality could also exert creative power at any distance through His all-extending attributes, seizing and wielding the incorporeal forces of Nature, such as electricity, gravity, light, heat, and possibly other forces which mortals know nothing of. We have no difficulty whatever in conceiving of God as a spiritual personality having an actual body constituted of such immaterial forces as we have referred to, in a concentrated degree, just as our sun is but a central concentration of heat and light, and thus God Himself could be the central source of all force, all life, all spirit, and all creative power. We surely ought to have no more difficulty in supposing God to be a self-existent being, the first and uncreated and only cause of all things possessing a body and personality, such as we have suggested, located in one part of His universe, than we would have to suppose Him without a personality in any conceivable sense and *exactly the same "everywhere as anywhere."*

Such an idea of a *personal* creative intelligence as President Spangler avers, is wholly unthinkable, and to our mind absurd. Indeed we cannot conceive at all of an immaterial substance, whether it be spirit or anything else, as a *person*, thus equally distributed throughout universal space, the same and in the same sense as much everywhere as anywhere; and hence we cannot conceive at all of a substance possessing the characteristics of *personality* that has not a *form* and that is not concentrated more in some one place than in any other.

Hence we do not and cannot intelligently believe at all in the omnipresence of God as to His *personality*, but only as to the reach, and sweep, and all-pervading presence of His attributes, and all-powerful instrumentalities. In all candor we fail to conceive of the idea of worshipping a God such as President Spangler describes, having not one element going to constitute *personality* such as Christ imaged, any more than we could conceive of the idea of adoring universal space or an all-pervading *ether*, because of its incomprehensible mystery, or worshipping the all-pervading principle of gravity because of its active power. Our only conception of the worship of God is that He is an almighty personality definitely located as to His personal presence, but capable of hearing our faintest whisper of prayer though countless millions of miles away, who can through His all-pervading intelligence see the sparrow fall or number even the hairs of our heads. That is the ideal God that meets the wants of humanity made in His image. If the heart is sad with suffering and sorrow, it is a comfort to appeal in prayer to a God who, we feel, has a *heart* to feel with sympathy for His wretched creatures. A *heartless* God is not adapted to human worship and would repel human adoration, and if He be without body or parts, we might as well pray to electricity or gravity for aught we are capable of conceiving. No difference if His heart is as large as the planet Jupiter and the form of His body should embrace the extent of a thousand solar systems, the human mind can only be satisfied with contemplating Him as a *person*, as a *father*, as a *friend*, as a real *sovereign* seated upon the real throne of the universe. The traditions and intuitions of all the nations of earth so recognize God and will ever recognize Him as a *personal being* to be worshipped.

As for furnishing us with a more ennobling or exalted idea of His mightiness to suppose Him equally pervading all space, as much "everywhere as anywhere," it is right the reverse with our conceptions of Deity. Our ideas of His majesty and grandeur, as well as wisdom and goodness, are enhanced by contemplating Him as a definitely located *person*, analogous to Christ's personal presence, with all-penetrating attributes, through which, and the immaterial forces of Nature, He exerts His power and supervises by His intelligence to the very bounds of creation. Surely this is more ennobling as a rational conception than to assume that He is obliged to be *personally* present at every place in the universe before His intelligent power can be exercised! Such a view would limit the Almighty more, in our estimation, than the grand conception we have here tried to present.

It seems further, that to argue against this view of God's actual personality and bodily presence at one definite part of the universe, as does President Spangler, is to conflict directly with the plainest texts of Scripture. The sacred writer could scarcely have selected stronger or plainer language to justify our view of God's real personality than where he speaks of Jesus as the "express image of His person." The very idea of an "image" necessarily implies *form* though it metaphorically includes moral likeness. You cannot make an "image" of *electricity*, or even imagine such a thing. It would be regarded as unintelligible to talk of anything being the express "image" of *gravitation*, or any other all-pervading force, operating the same "everywhere as anywhere;" though we can easily conceive of such force being concentrated at some given point a million-fold stronger than its average distribution. Hence we regard the very idea of "image," in any literal sense, as overthrowing the

notion that "God is without body, parts, or form." But when the Aposile adds to this term the express "image" of God's "*person*," we think all argument should cease. In all sincerity we fail to comprehend how any Trinitarian, who believes the evangelical doctrine that Christ was "very God," can be puzzled for a moment over the conception that God Himself was a real personal being, definitely located as to His body in one part of His universe, where, upon His mighty throne, He sends forth through His attributes the eternal messengers of force and life and power to the very outmost bounds of creation. We therefore see nothing serious or dangerous, theologically speaking, in this view of God's personality, since it no more limits the universality of His power, wisdom, or presence throughout space, than it limits the power and mental presence of the teacher, because his person or body does not fill the entire school-room! He fills the room, however, in a more effective sense, observing and controlling all that transpires, through the pervading presence of his finite attributes, just as God, through His infinite attributes, effectively fills the entire universe. If there is anything in this view of God's personality—call it anthropomorphism or what you like—that any Christian man needs to become alarmed at, we fail to see it. If it is wrong, then the whole Bible is wrong. The entire imagery of Holy Scripture plainly accords with this personal view of God's being as our Father and Creator. Christ for example, promises His disciples a home where they are to reside forever with their Father in Heaven. "In my Father's house there are many mansions,"—"I go to prepare a place for you." The very idea of *house*, *mansion*, *place*, etc., implies a definite locality. What kind of a "house" would it be in which the Father resides, extending throughout universal space, "the same everywhere as anywhere"? It must be such a house, if God is such a personal being. If His children are to occupy such a "house" in company with their personally omnipresent Father, then every Christian man or woman becomes personally omnipresent the moment he or she dies! That is, he or she loses all personal form and consequent identity, and becomes attenuated or dissipated throughout universal space as much, "everywhere as anywhere," like the Father with whom they are to dwell! Who could look cheerfully forward to such an attenuated mansion, or to such a meaningless and universally dissipated personal existence? No, when Christ taught His disciples to pray "Our Father who art in Heaven," He scarcely meant to impress upon their minds, that there was no divine "Father" in any personal sense in the universe, or that there was no Heaven in the sense of a real locality where God could personally reside. If President Spangler's view of God's being and essence be correct, Christ could not go to His Father in Heaven, because He was to Him already, as much as He ever could be; and no Christian can ever go to Heaven where God resides, for He is to it already, since God's personal residence is everywhere—"the same everywhere as anywhere," if we are to accept the views of President Spangler.

We ask the reader to compare our view of God's being and substantial personality as here set forth with that of our contributor's, all in the light of Scripture and reason, and then decide the matter for himself. We have little doubt as to the result of that decision.

LIFE OF ALEXANDER CAMPBELL.

We have had amongst numerous other volumes for some months past, a handsome book contain-

ing a complete history of the home-life and writings of the late distinguished Alexander Campbell, the Reformer (the founder of the denomination generally known as Campbellites), written by his venerable widow now in her 82d year, and published by John Burns, of St. Louis, Mo. A letter just received from this highly esteemed lady, who is at present stopping with her daughter, Mrs. Thompson, the Post Master of Louisville, Ky., reminds us of this volume, and of the fact that we had not referred to it in *THE MICROCOSM*. This neglect was not due either to a want of appreciation of the great character of the subject, or of the sincere friendship of the author, but to an overwhelming pressure of unceasing labor that has precluded the possibility of reading any books outside of the special investigations and discussions occupying *THE MICROCOSM* from month to month. But we must say here that the book, judged from glances through it, shows unmistakable signs of masterly ability in the writer in clearly stating the salient points of the narratives introduced, and in the fine distinctions in doctrinal matters necessarily discussed in describing certain of the progressive movements of this modern religious movement during its early fortunes. The book is worthy to be read by all classes of religious thinkers, furnishing as it does food for reflection to the spiritual progressivist, whether or not he may agree fully with the leading tenets of the new departure introduced by Mr. Campbell. But especially should the members of that denomination subscribe liberally for the book which *par excellence* embodies the origin and substance of that great movement, which, starting at *nil* scarcely more than fifty years ago, now numbers about one million intelligent members. The book contains between 500 and 600 pages, with steel portraits of both subject and author, price \$2.50. Address Mrs. Alex. Campbell, care of the Post Master, Louisville, Ky.

DISCOVERIES IN SCIENCE AND PHILOSOPHY.

The present is an era of new and important discoveries, not only in useful arts and inventions for relieving men and women from drudgery, by means of labor-saving machinery and appliances, and by improving the conditions and environments of existence, but also discoveries of new sources of wealth, such as mineral and metaliferous deposits, and even new regions for extending the influences of civilization and the advantages of commerce, a work in which Mr. Stanley is so nobly engaged at the present time in Africa. But not less important than any of these are the abstruse and abstract discoveries in science and philosophy, for unfolding the hidden laws and principles of Nature, where intellectuality alone makes its achievements and records its triumphs. This field of discovery not only embraces the departments of physics, biology, physiology, histology, and even psychology, but it includes metaphysics as well, and even embraces, by natural gradation, the broad field of spiritual and religious philosophy. These latter departments of scientific and philosophical research, from pure physical science to pure religion, constitute the field specially cultivated by the Substantial Philosophy. In this field *THE MICROCOSM* is now recording its discoveries, and not a month passes but new laws or new explanations of old laws are being brought to the surface by some writer in these pages—genuine scientific discoveries, which tend in a greater or less degree to weaken faith in the mere theories of men however great, and to convince us that there is nothing

sure and absolutely true but heaven. If the most settled theories of science and philosophy, indorsed by the greatest minds of the world, present or past, are really now giving way and going down before the newly discovered facts, laws, and principles of Nature, surely religionists may take heart and smile serenely even amidst the skeptical arrows hurled by these same scientific leaders against the bulwark of the Christian's hope. To achieve such result more than anything else, is the special mission of *THE MICROCOSM*. Already it has shown such evidence of its ability to break through some of the strongest strongholds of accepted physical philosophy, upon which infidel scientists have relied confidently as corroborative proofs of their ability to destroy religion, that these assailants have been totally silenced, fearing to make any reply lest they should damage their cause worse by so doing. It is but truthful to assert that *THE MICROCOSM* is the first journal ever published in the interest of science, which boldly dared to fly the banner of religion from its mast-head, while defiantly challenging infidel scientists to the defense of every theory which directly or indirectly assailed the hope of a hereafter for humanity. So far its mission has been a pronounced success, and not only its editor, but its invincible army of contributors are encouraged to deeds of greater daring every month in the prosecution of the substantial campaign, and in their crusade against the doomed theories of false science. Some minor errors necessarily occur in the heat of desperate engagements, and when the victors even are momentarily blinded by the smoke of the conflict. But these things occur with the best disciplined armies and in the best planned campaigns with the enemy. Though such mishaps cause regrets at the time, they often prove blessings in disguise by inspiring greater caution in both rank and file, and the use of better precautions for all future engagements. May such mishaps grow fewer, and real victories for truth increase, till Substantialism shall cover the earth, as the waters do the mighty deep.

ONE OF A THOUSAND STRAWS.

MESSRS. HALL & Co.:

Through the kindness of a friend my attention has recently been called to the *Problem of Human Life* and *THE MICROCOSM*. It has been a revelation to me. I have been astonished to find that any one, however "obscure" and "ignorant," should have the temerity to attack a scientific theory mathematically demonstrated, and fortified by the combined wisdom of the ages.

Bitt as I read on, there came a dawning conviction that "Wilford" might not be altogether wrong, and not the ignoramus supposed. I see ahead an impending scientific revolution, and as I would like the latest news from the seat of war, I enclose one dollar for which please send *THE MICROCOSM*, Vol. 3. Send back numbers from August, 1883. Address Dr. J. A. D. Blake, Wilton, Maine.

THE TEXT-BOOK ON SOUND.

Many inquiries are beginning to come in from college professors and students concerning the promised text-book on acoustics. Several have asked, why is it delayed? Answer: We began to write it a year or more ago, and just then, new and important investigations were inaugurated bearing on the whole subject, with new and unanticipated objections to the substantial theory, all of which caused us to call a halt and reconsider

the whole question before finally putting the new departure into such permanent shape as a text-book. During the present volume of *THE MICROCOSM* the various discussions of Sound, Substantialism, Elasticity, etc., have grappled directly with these new objections and difficulties, meeting and explaining each in harmony with and in confirmation of the Substantial theory, however plausible and serious at first sight such difficulties may have seemed. This has now been done so extensively and tested in so many ways and by so many of the most ingenious opposers of the new departure that we may confidently assert that the *Sound* feature of the Substantial philosophy is immovably established as among the fixed things in modern physics. Hence now is about the time, unless new objections and difficulties, by new and more ingenious opponents, can be raised that require to be met and explained, to begin to cast about for the proper material and form in which to prepare and present the new book for publication. And even this must necessarily require time and patient carefulness to so shape all the details of the theory suitable to be taught in schools, so that the teacher will have little to do but to state and illustrate its general laws and principles to the thoughtful student. Providence favoring us with health, we hope soon to go forward with this important work.

WHAT DOES IT MEAN.

We learn that a party of our subscribers in old Steuben Co., N. Y., headed by our life-subscriber, Thomas Cotton, at Avoca, are searching for the spot where the log cabin stood in which the editor of *THE MICROCOSM* first saw the light. In answer to inquiries we have given the location as near as possible from memory after more than fifty years' absence, and have no doubt it will be definitely located from the memories of the oldest inhabitants who were then children. But what does it mean? Possibly our friends propose to bury us on that spot of ground, or what is left of us after the inner man departs. If so, we shall surely not object, since we have seriously contemplated visiting that county and, if possible, purchasing the little 25-acre farm as a romantically rural home for the rest of our life. This would be nice indeed, had we such assistance in the management of this magazine as to allow us to retire and do the work of editor-in-chief at such a sequestered spot. The very thought of writing our editorials at our birth-place would add to their inspirations. We will see what we shall see.

OUR LIFE-SUBSCRIPTIONS AND OUR MAGAZINE.

Now is the time for enterprising subscribers to take advantage of this liberal offer to renew by becoming a life-subscriber, since in the end it costs nothing to do so. (See the original offer on last page of cover.) Agents who are devoting time to canvassing for life-subscriptions have asked us to allow them to send in the names of new subscribers, either for this volume or the next, at 75 cents each, to be counted in with the \$15 order for books. We have now decided to do so. Any person sending in a club at 75 cents each for either volume, can add an order for enough of our books to make up the \$15, and the life-certificate will be sent. Let each subscriber, who believes that *THE MICROCOSM* is needed as a breastwork to dam the tide of materialistic infidelity now sweeping through the land, consider it as his own magazine, and act for its more extended circulation as if he were a special stockholder

in the enterprise. It is universally acknowledged that no other journal now published can take its place, and it is the opinion of its best educated readers, both among the clergy and laity, that it should be sustained efficiently at all hazards to keep up this work of checking the progress of scientific unbelief. It has shown its power to meet and survive all attacks from whatever quarter, but its future will be much more efficient, glorious and triumphant than its past has been, if every subscriber will unselfishly try to get his neighbors to take and read it by spreading its columns before them. We intend to do our part unflinchingly, and trust that each subscriber will feel the same responsibility in making this journal, *par excellence*, the religio-scientific missionary of the 19th century.

PROFESSOR TYNDALL HEARD FROM AT LAST.

We are pleased to announce to our scientific readers that there is a prospect of forcing or coaxing Professor Tyndall to break his long silence concerning the formidable assault upon the wave-theory of sound as made originally in the *Problem of Human Life*, and for three years continued monthly in *THE MICROCOSM*. A professor in this city was delegated by others associated with him to open a correspondence with the great English scientist and lecturer on acoustics, concerning the damaging arguments against the wave-theory now appearing in this magazine, and in this way if possible to call him out and induce him to show cause why the text-books on that subject, especially his own, should not be reconstructed. We are pleased to state that the first letter to the English physicist was rewarded with a polite but very emphatic reply, though brief, thus giving an indication at least of a disposition not to let the case go by default, and also indicating unmistakably that the attack now being waged against his favorite theory is not a matter of such profound indifference or contempt, but that he will reply to a respectful letter concerning it. We have been shown his first reply, so that we know whereof we speak. What will be the outcome of the New York professor's venture in the way of eliciting other responses or provoking controversy, we cannot now predict; but we can promise our readers positively that in the first number of the coming volume (August) they will have a decided treat in the shape of the entire correspondence up to that time. So let it be proclaimed to the colleges and professors among all peoples, nations, languages and tongues that Professor Tyndall has written a letter on the wave-theory of sound against the new departure, at the urgent request of an American teacher of physical science, and that this letter, with whatever else can be got from him, with the entire correspondence on both sides, will appear in the August *MICROCOSM*. Now the portentous question is, will the English lion chew up the American eagle and stop its noise on the subject of *sound*, or *vice versa*. To be or not to be, is the question, with *Substantialism*. Come on, McDuff—that is to say, Prof. Tyndall!

LIGHTNING-RODS—THEIR UTILITY.

Much diversity of opinion exists among practical men, as to the actual benefit of lightning-conductors attached to buildings as a means of safety; and even where such safeguards are believed to be all that is claimed for them, almost endless diversity of opinion exists as to the character, such as form and material of such conductors. Indeed,

it is held by some that the common lightning-rods, extending as they usually do high above the buildings to which they are attached, are the means of inviting thunder-bolts which would otherwise have passed the building and struck somewhere else. In the opinion of others the common tin spouts, which extend no higher than the houses and which are used for conducting the rain from the roofs of buildings into cisterns, form the best possible lightning-conductors in the world; and that a house properly equipped with such tin gutters and pipes is better protected from damage by lightning than if mounted with ordinary rods at every corner.

The Rev. Dr. J. P. Philpott, of Mexia, Texas, relates an incident which occurred at his own house completely justifying this view of the utility of such tin water-pipes as lightning-conductors. The house was well equipped with the common twisted white-metal rods. During a thunder shower, he tells us, a heavy bolt struck one of the rods, running down it a certain distance to where it passed within about an inch of the tin water-pipe, when it left the rod, jumping to the pipe and following it to the cistern, shattering its cover, etc. Surely, if the tin pipe had not been a much better conductor of electricity than the lightning-rod itself, there is no scientific reason why the electric current, when once passing along the rod, should not have kept on its track without switching off to another conductor, and that too without a connecting medium. Who knows but that common tinned sheet iron (the tin-plate of commerce), after all, is the best lightning conductor for the safety of buildings? And who knows but that the next great lightning-rod patent will be a simple tin tube armed at its upper end with platinized points, thus combining both a rain and lightning-conductor in one device? "Patent applied for!"

A FAIR OFFER TO PROF. MAYER.

Prof. D. Y. Bagby, B. S., J.L.L. B., of Giddings, Texas, proposes to be one of 100 persons, who will give \$20 each (\$2000) to Prof. Mayer, if he will print one single demonstration in *THE MICROCOSM* proving the truth of the wave-theory of sound as taught in any text-book or school philosophy. He proposes that the subscription be started at once, and that persons desiring to aid the cause, send in their names and thus give an impetus to true science in our schools.

Now we are forced to veto this proposition, as it would be a total waste of correspondence and postage to send and record such offers, as it is perfectly evident that Prof. Mayer dares not to write one syllable in defense of the wave-theory in any scientific journal, much less in *THE MICROCOSM*. As proof, let any one read the correspondence handed to us by Prof. Rogers, and printed in the April number of this Magazine. It may be safely averred that if \$20,000 in gold were deposited in bank to be paid over to Prof. Mayer on his demonstrating the correctness of the wave-theory of sound in the columns of this Magazine, it would be no inducement for him to make the attempt. He knows in his inner consciousness, that the wave-theory is wrong, and having written books on that side of the question which would be sunk into oblivion if the true doctrine of acoustics were known and adopted, he thinks the least said about it the better. But the storm is gathering, and all he or his fellow Professors in all the colleges can do to check it, will not break its force when it comes

A PERTINENT QUESTION FOR MR. OGLESBY.

A. WILFORD HALL, Ph. D.:

DEAR SIR:—I have read Rev. D. Oglesby's article on "The Sun—Is it Hot?" in the February MICROCOSM, with a great deal of interest. But if the sun's heat is generated by friction or by the rays passing through the atmosphere, would it not be hotter in the temperate and frigid zones than in the torrid zone? The sun's rays striking the earth's surface at an oblique angle, would pass through a thicker stratum of atmosphere, causing more friction, and if his theory be true, more heat, would it not? I ask for information.

Yours respectfully,

Jos. R. Ross.

CELINA, Ohio.

THE LEAVEN IS WORKING.

AVALON COLLEGE, Mo.

A. WILFORD HALL, Ph. D.:

DEAR DOCTOR:—Your remarks concerning professors in all the colleges teaching the wave-theory of sound do not apply to this institution. Our President, C. J. Kephart, during the present term, in which we have had the subject of acoustics under special discussion, has encouraged the students to a most searching investigation of the questions raised by you, and has frequently read to the class in physics from THE MICROCOSM and the *Problem of Human Life*. Although we use *Olmsted's Philosophy* as a text-book, we are not tied to it, only where we believe it to be correct. The result of this independent course on the part of the President is, that the members of the class, with scarcely an exception, have rejected the current theory of acoustics; and it has also been a means of gathering a large club of subscribers for THE MICROCOSM. Pardon this intrusion upon your valuable time, but I must say, God bless the man who is thus laboring to put science upon a common-sense and Christian basis.

Very truly yours,

(A student.)

H. M. AMBROSE.

THE MISSIONARY PAMPHLET ON SUBSTANTIALISM.

Up to the present writing the outlook is not the most encouraging for the publication of the above named pamphlet. We have, all told, received pledges for not more than 1,000 copies. We would be willing to make a sacrifice to issue it, if we were making any profits on the works we are selling, for we are not our own, nor is any money which our publications bring to this office. It all goes into the missionary fund and current expenses, as fast as received. Hence, if we could see our way clear not to run into debt, the pamphlet would be forthcoming. We will still leave the matter open for a month or so longer, hoping that there are yet hundreds who will tell us to put them down for ten or twenty copies at ten cents each. It need not be looked upon as a donation to any body—since the pamphlets can be sold at cost, or at least a majority of those ordered. We hope to be able to decide the matter positively in the next number of THE MICROCOSM, as to whether the pamphlet will be printed or not. Let all therefore who feel favorably disposed toward such a work, make the fact known by a substantial promise to take at least ten copies. If not printed, all such pledges of course, will be null and void.

BACK NUMBERS OF THE MICROCOSM FREE FOR DISTRIBUTION.

We have several hundred copies of odd numbers of the *second* and *third* vols. of THE MICROCOSM left over, which we now propose to send free to our friends who are disposed to try among their neighbors and acquaintances to raise a club of subscribers for Vol. 4, of this Magazine, commencing with the August number. Any friend who may wish to try to raise such a club, of *three, four, five*, or more names, will receive free, on application, a few copies to loan, to be read and returned, and so on till worn out. This will save talking, and will prove a hundred fold more effective in convincing strangers of the importance of THE MICROCOSM than anything its most eloquent friends can say for it. If lovers of this Magazine will pursue this course patiently, they will have little difficulty in working up clubs of intelligent subscribers, and thus secure one of the books named as premiums, which see elsewhere.

THOMAS MUNNELL AND THE STANDARD.

The *Standard* controversy with Eld. Thos. Munnell is beginning to "pan out," to use a gold mining phrase, quite encouragingly. We give two installments in this number of THE MICROCOSM, as a foretaste of others to come. It is a positive and amusing fact that whenever the "Office Editor" replies to one of Eld. Munnell's analytical responses, he really works himself up to believe that he has hit upon serious difficulties and presented unanswerable objections to the new departure on sound, so totally unaware is he of the real nature of the problems involved in that controversy. And we have no doubt but that he rests under this delusion till he is startled from his reverie with the uncomfortable disclosures of his opponent's response. Such was manifestly the fact in the last reply of the office editor, for immediately after it was in type he wrote to us plainly intimating that the *Standard* was intending to print the whole controversy in pamphlet form for distribution against Substantialism! We gently hinted, in reply, that he had better suppress his enthusiasm and wait till he had seen Eld. Munnell's response to his supposed invincible difficulties before commencing to get out his "pamphlet;"—that possibly when he saw the response, he might change his mind entirely, as to the propriety of issuing such a document. We are pleased to say that the editor of the *Standard* has since then received the Elder's response, and we more than suspect that his enthusiasm over the prospective issue of a pamphlet has dropped to zero, as indicated by the *Standard* thermometer. We would have liked to take a sly peep at that mercurial indicator about the time the office editor had finished reading Thomas Munnell's latest missive. Both these installments, *pro* and *con*, will appear in the next (July) number of THE MICROCOSM; and we take this opportunity to caution the office editor in the most friendly manner not to allow himself to enthuse prematurely over any "mare's nest" he may chance to discover till he sees how easily Eld. Munnell can smash the eggs.

¶ We are obliged to apologize to our readers for the defective press-work of a few of the previous numbers of THE MICROCOSM. We were misled by the printer, who claimed to be able to do first-class work. We have been obliged to make a change, and if there is not a decided improvement in this number, we will keep changing till it is right.

WILFORD'S MICROCOSM.

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THE LAWS OF MIND.—No. 10.

BY REV. J. W. ROBERTS.

Immortality of the Mind. The question of the immortality of the mind or soul (the terms are here used interchangeably) of man has been the problem of the ages. Volumes have been written upon the subject, and the ablest minds in every nation, age and clime where civilization has prevailed, have grappled with the ponderous theme and tried to solve the profound enigma.

Immateriality and indestructibility are sometimes assumed to comprehend or embrace all that is involved in immortality. This is a mistake. Others confound spirit and immortality, claiming that these are interchangeable terms. This also is an error. All three of these qualities or properties may be united in one organism without endowing that organism with immortality. It is true these are essential attributes of the greater and more God-like endowment, which is the crowning glory of man's inherited possessions. As has been shown already, all these qualities enter into the composition of minds of the lower orders of creatures, from whom this higher gift has been withheld. If these great qualities, with life added, do not constitute immortality, what does?

In order to get a full and comprehensive view of the subject, it becomes necessary to re-state some underlying facts and principles. The central pillar, the *spinal column*, so to speak of the mind is the *ego—I am*. Upon this foundation, around this column, the whole structure of the mind is built and clusters. This removed and it all falls into chaos. And to change the figure, but still retain the essential truth involved, around this central sun all the faculties of the mind revolve, and by it are kept in their proper orbits, so that each one is even in its place in this miniature solar system. Blot out the sun, and the whole system is in ruins—a shapeless unorganized mass. This *I am* being the essential entity of the mind, is that into which every act, thought and motion is assimilated, and of which it becomes a part. Hence, all the faculties of the mind pour their separate and combined efforts into this one great repository of all that is essential to individual identity, and this conscious being—this *I am*—with its absorption of all that is said, felt, thought or done, *is the man*. There are three faculties that bring information to this conscious center of life, being and intelligence. They are:

1. *Perception*, which takes cognizance of facts and events connected with material things, or those elements and entities in Nature, which are recognizable by the five senses. The province of this faculty is so well known as not to require further elucidation.

2. *Imagination*, which is the faculty of perception in the purely mental realm. This faculty of the mind has been very much misunderstood and abused. Itself has been too often confounded with its acts. Like men it may go astray; but like men and all else that God has made, in itself it is "very good." The vain "imaginings" of St. Paul are not to be understood as a reproach upon this property of the mind, but of its abuse. Perceptions of material things are often imperfect and lead to imperfection of knowledge and of resulting

action. This useful power is also often used to convey to the mind a most vicious class of information; but who would think of condemning the faculty itself, either for its imperfection in the one case, or its abuse in the other. Imagination has its five senses, if the terms may be so used, all of a high and immaterial order, and they observe things in the strictly intellectual domain, the results of its labors being conveyed to the conscious entity and recorded, as are all other mental facts, by memory. It gives wings to faith and hope, which are purely mental in their essence. It goes out into the vast fields of space and gathers material of the most varied character for the mind to work up, some of which is woven into poetry, some into romance, some into allegory, some employed by reason, etc., and in short it will be found to be the warp—and often much of the woof—of every web the mind weaves in this department of its operations. Its range of observation is so exceedingly wide and vast as to be practically limitless; and the air-castles it builds are without number, and yet we may reasonably infer that not one of them is an impossibility, for it is not rational to ascribe to any faculty of the mind *absolute creative power*, even though it be in but those things which are termed imaginary phantoms; for these have substance enough in them to be recorded by memory, and are, doubtless, daguerreotyped upon the imagination by unperceived agencies, which cannot be recognized by the mind while in its prison-house of clay, but of which when it is free, it may obtain full knowledge. Dreams are but perceptions of the imagination, and they are often wonderful. It would be interesting to pursue this theme, but as it does not enter into the purpose of this paper to present more than an outline of facts and principles, it is passed for the present. All the fruits of the active and tireless energy and labors of this faculty are absorbed by, and incorporated in the *ego*.

3. *Conscience*, the perceptive faculty of the moral nature. It perceives the right and the wrong in everything presented to the mind, and communicates this knowledge to the *I am*. Memory records its verdict; volition acts upon the information filed, and will carries out the decision rendered. All this enters into and becomes a part of the conscious self. Like the other orders of perception, conscience may be defective for various reasons, and hence, her vision be imperfect, and her conclusions erroneous; but she is oftener over-ridden and her judgement set aside by passion or will when she is right, than she is wrong in herself or in the essence of her determinations. But this point properly belongs to another branch of this subject.

Now, as already remarked at each stage of the inquiry, all the varied information brought to the mind by these faculties, together with the acts based upon them by passion, reason, judgement, volition and will are recorded by memory, and become, a part of the conscious being, the *I am*, into which they are engrafted and where they partake of the root of that tree, and become an integral part of the same. In a word, the faculties of the mind united and single, are but the servants of the *I am*, as the fingers belong to the hand, the hand to the arm, and the arm to the body. It requires all of them to make a perfect

body, as well as every other member pertaining to it; and in like manner the mental faculties are all necessary to constitute a perfect *ego*, and the mind of man being progressive, all the acquired attainments of these faculties are also absorbed into the one central unit.

In the physical world nothing is destroyed in the sense of annihilation. Even waste or lost power, energy or force, as it was and is yet termed in mechanics, is now ascertained to be only correlated. It is also a well established law of Nature that "like begets like," and also that like correlates or assimilates like, and these laws are invariable and inexorable. Thus heat returns to itself if drawn aside; and in like manner every other substance *seeks its own*. What is true of matter and substance is also true of mind. As previously stated, every mind is a unit, the unity centering in the *ego*. Every faculty of the mind is imperishable, and every act it puts forth which is engrafted into it and becomes a part of its consciousness, partakes of the root and the original tree, and cannot be separated from it. This is manifest. It has been demonstrated that thought is indestructible, and memory likewise; and these facts are but re-enforcements of the position here established also in the very nature of things. Now let us summarize and apply the foregoing facts and principles.

Mind is immaterial, indestructible, life, intelligence, spirit, self-conscious, self-governing, progressive, and is endowed with intellectual and moral attributes. The mind of man is now under consideration. As heretofore shown all these properties enter into and are essential qualities of the mind, and cannot be subtracted from it. They with the faculties and their acquisitions constitute its concrete unity. As not an atom of matter or the least particle of substance can be blotted out of existence, no more can the most infinitesimal part of mind be obliterated, it must *all* abide forever. And as every species of matter or substance in Nature seeks its own, and *only* its own, so likewise, every fiber and parcel of mind is drawn to itself, and in its essential unification with the *ego*, finds and remains in its eternal home. And herein is exemplified and epitomized that wonderful complexity and sublime unity, which pervade the entire universe, making of all its parts one grand and comprehensive whole.

These conclusions which are the only logical and legitimate ones that can be reached in harmony with the known laws of Nature, and which are written in the very constitution of things, are also clearly established by another line of argument based on equally sure and firm foundation.

The imperishable character of the thoughts of the ancient worthies of sacred and profane history, has already been clearly set forth. What is true of the thoughts themselves is equally true of their analytical parts. They not only come to us in all their original vigor, but they bring with them the *personality* of their authors. We feel that Homer, Plato, etc., are communicating to us of themselves. Their poetry, eloquence, logic appeal to the same faculties in us, that produced these modes of thought in them. Their reason speaks to our reason; their imaginations to ours; and their conclusions call for action on the part of our judgment. Each faculty of theirs talks to the same faculty in us. In the case of Moses and the sacred writers their vivid thoughts quicken our moral faculties into action. They speak directly to our conscience and consciousness, as well as to the other attributes of the mind, and in every case the faculty addressed responds in some manner to the appeal to or demand made upon it. In all these

cases it is the *identical person* who is communing with us, and the particular faculty excited to action in him, is in such case *quickened* in us to activity by the thought injected into it. The *person* and the *faculty* both speak to us.

Now it is absolutely certain that these men could impart to their thoughts nothing that they did not themselves previously possess, for that most conclusive of reasons, that out of nothing something cannot come. It is equally true that no general or specific quality could be bestowed upon their thoughts, which did not first exist in the mind that gave them birth. Some of these qualities have already been pointed out—immateriality, indestructibility, life, intelligence, spirit. To these may be added *unity* and *diversity*, that is the *oneness* of the *personality* of the thinker, and the *diversified faculties* addressed, which combined, make up the unified whole. Thus *Homer* addresses us, and *Homer's vivid imagination* also, and we respond as a unit, while our imagination is vivified by his thoughts. *Plato* speaks to us, and *Plato's reason* also, and we respond as before, our reasoning powers being now called into action. *Moses* talks with us, and the *commands and precepts* of *Moses* appeal to our moral faculties. The whole mind, the *ego*, gives attention, and the moral powers are *quickened into activity*. Thus as just stated, the *identical person* and the *identical faculty* of that person are addressing us at the same time, and we are brought to feel *both these forces in one*. Hence we know that these men, in their unity—the *ego*—and in their diversity in unity—all their faculties in one—are *still alive*; for their thoughts are alive and *quicken us*. They are superior in all respects to their thoughts, and out of their more abundant fulness supply these thoughts with all their essence, force and vitality. If either can perish, it will be *must be*, the thought and not the thinker; for the latter endows the former with every quality it possesses, and of necessity must first possess before imparting. "The greater contains the less," but the less cannot contain the greater. The cause, too, must be adequate to produce the effect. Therefore the mind possesses, in a preëminent degree, *all the properties or qualities* of the thoughts it sends forth. This is self-evident, in fact.

It is thus established beyond question that the minds of *Moses, Homer, etc.*, are yet *alive and in full vigor and activity*. It is also clear by the same unanswerable facts and logic that each faculty of these men is yet alive and clothed with undiminished vital force. We have these truths written upon our own consciousness; for we *know* the thoughts of these men *now* affect us. *They are superior to their thoughts in everything*. It is, therefore, a clearly demonstrated fact that the minds of these men, *with all their faculties complete and unimpaired, are in a state of actual, conscious existence at this hour*; and if now alive and in all their pristine vigor, they will remain so for ever. As their thoughts abide perpetually, *much more will they*. And this *conscious, unbroken, unified being, continuing forever without loss of any kind, is IMMORTALITY*.

This property of mind does not inhere in matter or substance, and cannot be derived from or imparted to them. Not being derivable from nor communicable to matter or substance, it *must* come from some other source; and that source must contain all these qualities or properties in the most eminent degree; and as such countless myriads of streams are continually supplied from it, this original fountain must be inexhaustible. How near does this come to proving the existence

of God—the great Fountain—by the severest logic, without sophistry or assumption? Immortality being indisputably proven as an attribute of man's nature, that nature *must have an immortal Author*, for the oft quoted reason, "that out of nothing nothing can come," and the necessary sequence, that nothing can be communicated in *any direction*, by any person or thing, that is not first possessed by that person or thing.

This argument is built up from foundation to pinnacle on the immutable principles of science, which form the basis of all thorough investigation, and are universally admitted to be axiomatic truths. It may, therefore, be considered as one impregably established fact that the mind of man is immortal.

The fact that the mind for a time inhabits the material body, has no more to do with its essential immortality than the fact that steam is not the engine it drives, music the instrument that is employed to manifest it, or a multitude of other illustrations of similar import. A foolish man once dissected a large bellows to find the source of the power which produced the effects visible to the eye. Some scientific philosophers(?) exhibit about the same degree of mental capacity in reference to the mind as did that unfortunate man in searching for the air in the bellows!

The immortality of the mind is also established, from the fact that it aspires to such a heritage. That aspiration must be born of something, and that something must possess this quality and be adequate to impart it. Nothing but the mind, or the Author of the mind, possesses or can bestow the endowment itself or the desire to possess it. Hence the immortality of the mind is established from both internal and external evidence.

No point is assumed, or begged, or taken for granted in any part of this argument, from beginning to close. Truth is immortal and cuts its own way, all that is required is for it to be properly interpreted and understood.

The lower animals are not endowed with reason or moral attributes, are not subject to civil, moral or intellectual laws, and hence are not immortal, though indestructible, as is everything else in the universe. By what laws their inferior minds are correlated, we do not know, and probably shall not while imprisoned in flesh. The solution of the problem would probably be of little or no practical value.

THE FOREKNOWLEDGE OF GOD—REPLY TO REV. WILLISTON'S SERIES OF ARTICLES.

BY PROF. I. L. KEPHART, A. M.

It is not for controversy, but with a desire to aid the cause of truth, that I attempt to reply to Rev. T. Williston's strictures on the position held by Dr. McCabe, myself and others respecting the foreknowledge of God. In doing so, I shall not occupy space by fully exposing his fallacious reasoning and laying bare all the absurdities to which his arguments necessarily lead. Nor shall I attempt an exposition of all the passages of Scripture which *he* thinks teach the absolute foreknowledge of God. Any one desiring to see a complete, rational, common-sense exposition of those passages, in harmony with the doctrine that God has not foreknown, and in the very nature of things *could not* foreknow, from all eternity the final destiny of free moral agents, need only procure and read Dr. McCabe's book, entitled: "The Foreknowledge of God."

Rev. Williston claims that the case of Judas is one in which the Scriptures very clearly declared that God absolutely foreknew from all eternity the crime and the consequent damnation of at least one free moral agent, and that being so, he concludes that by that case alone the correctness of the dogma of absolute foreknowledge, is demonstrated. He says, (Feb. MICROCOSM, page 202), "That God *did* know before He created Judas that hell would be his final abode, is made certain by the following passages of Scripture: Matt. xxvi: 24, 25; Luke xxii: 22; John vi: 64, 70." But if he will read Matt. xxvi: 14-16, and then 25, 26; Mark xiv: 10, and 18; Luke xxii: 3, and 22, and John xiii: 3, and 27, he will see that only after Judas had actually agreed with the chief priests to betray Christ, did He say clearly and emphatically to His disciples, "One of you shall betray me." How, then, do the passages quoted by him prove that Christ foreknew *from all eternity*, or even before Judas had purposed in his heart to do so, that he would betray Him? John vi: 70, only proves that Judas had the spirit of the devil in him at the time Christ was speaking; and verse 71 is a remark of the evangelist, *written after Christ was betrayed and crucified*, and only declares the fact that Jesus spoke of Judas who, *at the time Christ spoke*, had the spirit of the devil in him, and afterward did betray him. But it will be noticed that Christ, at this time, says nothing about Judas betraying him. Verse 64 only teaches that, from the *beginning of Christ's ministry*, He knew, as He taught, who believed Him to be the Messiah and who did not, and that *as soon as Judas had purposed in his heart to betray Him*, Christ knew that he would do it. True, Rev. Williston says this is a conclusion which he thinks but few expositors will indorse. But what of that? The fact is, most expositors have been so terribly blinded by the dogma of absolute foreknowledge that they have overlooked some of the plainest teachings of Scripture on this point, just as he, when quoting Matt. xxvi: 25, 26, overlooked Matt. xxvi: 14-16.

But let us look at the case of Judas from another standpoint. Rev. Williston says, (March MICROCOSM, page 229), "It is undeniable that Judas's treachery was a foreknown event and *certain* to occur;" and then he asserts that the fact that he experienced remorse for what he had done, proves that he could have avoided betraying his Master. But how could it have been *certain from all eternity* that he would do the deed, if he could, by any possibility, have avoided doing it? Suppose he had, in his freedom, after all, refused to yield to the temptation to betray his Lord, as Rev. W. says he could have done, would that betrayal have occurred in accordance with the foreknown certainty of its occurrence? But Rev. W. says that while Judas was perfectly free to avoid betraying Christ and could have done so, yet it was absolutely certain from all eternity that *he would not* avoid doing the damnable deed,—that it was *not* a case of "*can not*," but a case of "*will not*." In order to show that this is only a subterfuge, and that it really relieves the foreknowledge dogma of none of its ridiculous and monstrous features, I will agree to consider it only as a case of *certain* "*will not*."

Then, according to Rev. W.'s logic, God foreknew from all eternity that, in case he created Judas, he would *certainly* betray Christ and thereby bring upon himself a doom so intolerable as that "*It had been good for that man if he had not been born*;" Matt. xxvi: 24. That is, God created Judas, knowing *certainly* and beyond the possibility of a doubt or mishap, that hell would be his doom, and that it would have been better

for him never to have had an existence! Could the devil himself do any worse? Did Judas create himself? Was it his fault that he was brought into existence to attain to an infallibly *certain, foreknown* destiny of damnation?

It will surely not be denied that God was free not to create Judas; and even after he had created him and while he was an innocent babe in his mother's arms, God had it in his power to end his earthly existence and take him, in his innocence, from the cradle to heaven. But, according to Rev. W.'s logic, God deliberately and *freely* (for he says that God is so free that He could even *lie*, if he *chose* to do so,—Feb. MICROCOSM, page 203) brought Judas into existence *when he knew with absolute certainty*, that an awful hell would be his final destiny! This is, in effect, that old diabolical, monstrous, long-since-exploded dogma of infant damnation; for God might just as well send an infant from the cradle to hell, as to create it and let it live to manhood, knowing *certainly* that, in case He did create such an infant and let it live to accountability, it would be forever lost. Would Rev. W. willingly and deliberately beget a child if He knew *certainly* that in case he did, that child would be forever damned in hell? I can not believe he would. And yet he strains logic and misinterprets Scripture to prove that "The Lord God, plenteous in mercy, who delighteth not in the death of any, but would that *all* would come unto him and live," actually brings into existence human souls, whom He knows, *when creating them*, will be miserably damned! Is it any wonder that, in the face of such theology and such *misinterpretation* of Scripture, there are infidels? Judas was in no way responsible for his existence; and if God clearly and *certainly* foreknew that in case He created him, hell would be his destiny, then, by giving him existence in the face of such knowledge, He willingly, knowingly and *certainly* added one more soul to the number of the damned. Does not that amount to arbitrarily *decreeing and foreordaining* his damnation? It certainly does; and this is the damning blot on the theology of Rev. W. and all his School. By teaching the absolute foreknowledge of God, they teach that the infinite God creates some human souls, knowing in each individual case, *and when creating them*, that an awful hell will *certainly* be their final destiny, and that it would be good for them not to have an existence; and that He does it all "*for the manifestation of His glory!*" and "*for the glory of His sovereign power over His creatures!*" What glory can result from His creating a human soul knowing *certainly* that it will writhe in hell forever? To all souls thus created the terribly sarcastic lines apply:

"You can and you can't,
"You shall and you shan't;
"You will and you won't;
"You'll be damned if you do,
"You'll be damned if you don't."

Such theology exalts God into a monster of cruelty and despotism. Would Rev. Williston send his prattling little child on the street to play, if he knew *certainly*, that it would abuse the liberty he gave it, go on the railroad track and be killed by the cars? Surely not. Yet he would have us believe that God sends innocent babes from the cradle into the world, when He absolutely and *certainly* knows that those identical babes will,—not be killed by the cars, but *infinitely worse*,—be forever damned in hell! and this too, when He could so easily take them from their innocent cradles straight to heaven.

I am very glad that the advancement of intellectual and spiritual enlightenment is rapidly driving such horrible theology to the owls, moles and

bats where it belongs. It is, in this enlightened day, an unpardonable slander on the good and merciful God. It has done more to obstruct the progress of Christ's kingdom on earth than all the infidel, agnostic and atheistic works ever written. It is a blot alike on both the Calvinistic and the Arminian theology, and is an inseparable consequent of the dogma of absolute foreknowledge. The Calvinist says, in substance, God foreknew when creating Judas that he would betray Christ and be forever damned for doing it, and He, therefore, foreordained it should be so ("He foreordains whatsoever comes to pass"). The Arminian, less consistent, says God foreknew when creating Judas that he would *certainly* be forever damned, but He did not foreordain that it should be so.

His replies to "*objections three and four*," given in the May MICROCOSM, surely do not amount to good nonsense. If, as he contends, God has infallibly foreknown, as a certainty, from all eternity, and does now so foreknow what my final destiny will be, and I must believe that he has so foreknown and does now so foreknow it, how then, in the name of reason and common sense, can I "strive to make my calling and election sure?" It will be just as God now knows, *and has always known*, it will. If He has always known that it will be a destiny of endless bliss, then it will be just so; and surely, in that case, I need give myself no concern; and if He has always known that it will be a destiny of endless woe, then, no prayers nor tears nor agonizing pleadings of mine can change it. Hence, why should I in either case, strive, or pray, or resist temptation, or abstain from sin? According to his theory and logic, my destiny will be exactly as God foreknew it would be millions of years before I had an existence.

I would ask, what is the difference, so far as the result is concerned, between Infinite Power creating a soul for the express purpose of damning it, and that same Power creating a soul knowing with infallible certainty that it will be damned? Has God pleasure in the misery and damnation of His creatures, that He should give existence to such as He knows with infallible certainty will be forever damned? Why then did He say: "As I live, saith the Lord, I have no pleasure in the death of him that dieth?" Why then, did Christ weep over Jerusalem? Why did it repent Him that He made man? Gen. vii : 6.

For an explanation of my position respecting man's freedom and God's foreknowledge, the reader is referred to my articles that have appeared in THE MICROCOSM of June, July, August, September and October 1883, (especially those in the Sept. and Oct. Nos.), and the article in the March No. entitled, *The Origin of Sin*. I will only add here that, according to the very nature of that freedom which renders angels and men capable of virtue, and morally responsible for their choices and acts, no such angels and men were or are absolutely certain to continue loyal to God, *until they have ended their probation*. So long as they are in a state of probation, that is *exposed to and susceptible of temptation*, it cannot be certain that they will not apostatize, no matter how good their principles may be. Lucifer and his hosts, and our first parents, being on probation were tempted (for probation implies temptation), and being tempted, fell in spite of their good principles. But when once the loyal free moral agent's probation is ended (that is, when once the loyal free moral agent is completely relieved of or placed above all temptation), it is *then* absolutely certain that he will never rebel against his Creator; for then he is not only

firmly established in his love of truth and righteousness, but *all temptation is removed*. Hence, although he will retain his freedom forever, it is absolutely certain that in the exercise of that freedom, he will remain loyal to God forever, being no longer assailed by temptation. This is the case with all the saved Saints in heaven. As Bishop Butler has so clearly shown, an ordeal of temptation is necessary to the development and establishing of moral character, and while undergoing that ordeal, it cannot, in the very nature of free moral agency, be *certain* what the choices and acts, and the consequent destiny of the free moral agent will be; but for all those who "endure temptation *until the end*," and thereby successfully pass their probation, there is a certain reward of endless felicity. By successfully passing their probation, they become "*the elect*" *certain*, and are certain, thereafter, never to fall. All men are "elected unto salvation, through sanctification of the Spirit and belief of the truth." That is, all men being subjected to probation (trial), are granted the great privilege of accepting and obeying the truth so far as it is revealed to them, and thereby have the great privilege of making their "calling and election *sure*." But only those who *do* believe and *continue faithfully until they have passed their probation*, are absolutely certain to inherit everlasting life. "*He that endureth to the end, the same shall be saved.*" A man's probation may end before the death of his body; it *never* extends *beyond* the death of the body. See Matt. xxv : 46.

God, being absolutely and eternally pure and holy, and infinitely incapable of being tempted with evil or sin, was never on probation; hence, it is *eternally certain* that He will always do right, though infinitely free.

For passages of Scripture that prove that God does not foreknow the future choices of free moral agents, *in matters that determine and fix moral character*, the reader is referred to the following: Exodus xvi : 4, and xxxiii : 5. Deut. viii : 2, and xiii : 3, 2d Chron. xxxii : 31; and Jeremiah vii : 31, xix : 5, and xxxii : 35; also, Ezekiel, xviii : 19-32, Jer. xviii : 7-10, and Jonah iii : 9, 10; also Gen. vii : 6, and 1 Sam. xv : 11.

EVOLUTION: ONLY A HYPOTHESIS.—No. 3.

BY REV. J. J. SMITH, D. D.

Having already shown the utter impossibility of getting organization and life started from inorganic, lifeless, and inert matter upon the theory of Atheistic Evolution; and also how absolutely impossible it is upon this hypothesis to account for the variety of distinct plans of structure among organic forms of life; and the marvellous wisdom displayed throughout the vegetable and animal kingdoms in their formations; we advance another step to notice another insurmountable difficulty, namely, for Evolutionists to show from the geological record that the sub-kingdoms and orders are all connected with each other by gradual transitions. And unless this can be done the whole theory breaks down as a scientific formula, and passes into the category of mere speculation. Now what are the facts in the case? Why! instead of finding gradational forms upward all along the line of being, so that each sub-kingdom is seen gradually fading away into the next above it, as Evolution demands, we find distinct and specific groups, types and orders, with immense gulfs of structural differences between them, that cannot be bridged over. This fact has been seen so clearly by Prof. Haeckel, that he has fully admitted it, and thereby has virtually

surrendered the whole question. His words are as follows :

"There appears indeed to be a limit given to the adaptability of every organism, by the type of its tribe or phylum. . . . Thus, for example, no vertebrate can acquire the ventral nerve-chord of articulate animals instead of the characteristic spinal marrow of the vertebrate animals. However, within this hereditary primary form, within this inalienable type, the degree of adaptability is unlimited."—(History of Creation, Vol. 1, p. 250.)

In reference to this astounding admission, I cannot do better than to quote the reply of Wilford Hall, who says : "What clearer proof do we need than this concise statement that there must have necessarily been a special miracle required at the beginning of each new tribe or type of organism, since the adaptability of a being is rigidly confined to the 'type of its tribe'?" It may develop or be transmuted in every direction, he says, within the "tribe or phylum," and to this extent the Professor insists that "the degree of adaptability is unlimited," but it cannot be transmuted beyond such *type or tribe*. He does not leave us in the slightest doubt as to what he means by 'type,' 'tribe,' or 'phylum,' but distinctly illustrates his meaning by saying that it signifies the same as *sub-kingdom*, since 'no vertebrate animal can acquire the ventral nerve-chord of articulate animals instead of the characteristic spinal marrow of the vertebrate animals'; and, of course, as the articulate animal is also confined to the 'type of its tribe,' since 'every organism' is thus limited, no 'articulate animal' could overstep the boundaries of the 'tribe' or 'phylum' to which it belonged. . . . Hence "the first animal with a 'spinal marrow' and a backbone, or the first fish, was the work of miraculous creation, since no articulate animal, or those in the sub-kingdom below it, being limited to their type or tribe, *could have been transmuted into a vertebrate animal!* There is no evading the force of this annihilating admission."—(Problem of Human Life, p. 516.)

Some atheists, in order to give apparent plausibility to the theory of Evolution, or the transmutation of the sub-kingdoms, have affirmed that vertebrates in passing from their primary embryonic forms to their perfect formations take on at different stages the types of lower sub-kingdoms, and in this way make it presumable that they were originally developed from these lower forms. Upon this subject Prof. H. A. Nicholson of the University College of Toronto, says:

"The embryo of a vertebrate animal was believed to pass through a series of changes corresponding respectively to the permanent types of the lower sub-kingdoms, namely, the protozoa cœlenterata, annulosa, and mollusca, before finally assuming the true vertebrate character. Such, however, is not the case. The ovum of every animal is from the first impressed with the power of developing in one direction only, and very early exhibits the fundamental character proper to its sub-kingdom, never presenting the structural peculiarities belonging to any other morphological type."

"A vertebrate," says Prof. Agassiz, "never resembles, at any stage of its growth," anything but a vertebrate, or an articulate any thing but an articulate, or a mollusk any thing but a mollusk, or a radiate any thing but a radiate."

So this supposed glimmer of a transitional connection between these orders must be given up. An additional difficulty is also found in the fact that these sub-kingdoms, instead of forming a progressive series of steps from the lowest to the highest (as the theory of Evolution absolutely requires), they are found to stand in no such relation

to each other. Prof. Agassiz, whose authority on this subject will not be questioned, says :

"If they are linked together as series, then the lowest acalephs should stand next in structure above the highest polyp ; and the lowest echinoderm next above the highest acaleph. So far from this being the case, there are on the contrary, many acalephs which in their specialization, are unquestionably lower in the scale of life than some polyps ; while there are some echinoderms lower in the same sense than any acalephs."—(Methods of Study in Nat. His.)

The same difficulty is encountered by Evolutionists at every step of their investigation all along the line of animal life, in which higher forms of organization are found to precede lower forms, thus overturning the very foundation of Evolution.

"The earliest fishes," says Prof. Dana, "instead of being those of the lowest grade, were among the highest; they were ganoids or reptilian fishes." Again, he tells us that, "Tribolites found in the first fauna of the salurean, are not the lowest crustaceans." And further, that "No fossil snakes are found below the cenozoic, although large reptiles abound in the mesozoic."

These facts are certainly fatal to the theory of Evolution. Here it is seen that although reptiles are more highly organized than snakes which are harmless, yet they appear in the geological record millions of years before the latter.

Again, "oxen date from the later tertiary, long after the appearance of many higher mammals, as for instance the dog, tiger, monkey, etc."

Now if there be any truth in Evolution, why should there be not only such a manifest want of evidence in its favor, but such an array of facts against it? To this question we have a right to demand of Evolutionists something more than mere guesses. We have a right to demand proof in the form of facts, which they are in honor bound to give, or else stop this absurd practice of parading their visionary speculations before the public as the deductions of science. Every intelligent person knows, as Prof. Leves has justly said when speaking upon this subject, that "A scientific hypothesis not verified by experiments *is not science*, but metaphysics." In other words it is only a theory, a speculation, a hypothesis.

NORTH TARRYTOWN, N. Y.

OPPOSITES.

BY J. R. HOFFER, ESQ.

There can be no finite existence without opposites ; sides or parts opposite each other ; opposite properties that can unite or separate ; a force and something upon or into which it can act ; a cause and an effect ; and where there is something there must be something else for it to rest on—an opposite. Even the substantial and phenomenal, the real and the apparent, are opposites.

To obtain a correct knowledge of nature it must be studied in its relation to the First Cause. Copernicus could only discover the true motion of the heavenly bodies by placing himself, in mind, upon the central orb of our system ; and so may others only hope to obtain a correct scientific knowledge of creation and nature, by trying to view all things from the side of the Creator. A growth or development naturally looks like a new production ; but with the infinite God, to whom and whose dominion nothing can be added, it is only the extension into a state of finiteness of that which exists from eternity.

Have we a proper, or even a reasonable, con-

ception of what is implied by infinite or unlimited? By the Infinite God, of infinite love, wisdom and power? It implies absolute completeness, so that nothing can be added or removed. It cannot change, consequently, not develop, improve or deteriorate. There can evidently be but one Infinite or Unlimited, who has nothing to interfere with or limit Him ; therefore even the works of the Infinite must all be finite.

An opposite to a producing or developing force is not opposition, but that which limits, gathers, contains, holds, and thus prevents dissipation or non-effect. It is something against which the force or power can act, or that limits its action. A force is only known by the result of its action in or upon something tangible to itself, which may or may not be another force. Calling a force positive and that upon which it acts negative, action can therefore take place between two or more positives or positive opposites, or between positives and negatives.

All forces are from life ; from the living God, who is "The Life." In the Godhead is infinite goodness and truth which in action are infinite love and wisdom, and these constitute infinite power. Love and wisdom are both forces ; the one the acting, and the other the guiding and selecting. Divine or infinite love and wisdom are therefore the creating power of God ; they are opposites acting in perfect harmony. And Creation being a production by love and wisdom, it necessarily bears their impress in all its forms and conditions. Man has affection and understanding, from which are his love and wisdom ; but being finite their action is not necessarily harmonious, and a man can will or love to do what he knows to be wrong. And in persistently disregarding the voice of his wisdom or judgment it becomes perverted. If this were not so he could never choose wrong or evil, nor even decide between right and wrong or good and evil. There is indeed no essential evil ; but in choosing contrary to use, or in misapplications, evil effects are produced.

Animals also have love and wisdom, but only concerning their maintenance, propagation and defence. Vegetation does not possess these faculties in a voluntary degree ; yet all plants are developed in harmony with them ; the power to gather substances for their development, from earth and air, being from love, and the selecting and disposing of these from wisdom.

These two laws of love and wisdom, or attraction and selection, are operative in all combinations of matter, entering into forms as well as substances. The human form, in its organization, is perfectly in harmony with human affections and mind ; and so are the forms of all living creatures respectively in harmony with their characters. The forms and substances of plants are also adapted to their natures ; minerals crystalize according to their kinds, and all substances assume forms according to their uses. Herein is infinite love and wisdom.

No person can rationally contemplate what is seen and known of the universe without being convinced that there is a grand purpose in it. This is a further assurance that the creating power is Divine love and wisdom, for these can not act otherwise than from a purpose ; and therefore everything that is made, even the least iota of spirit, life or matter, is applicable to the grand original purpose. There can be no purpose without love to urge and wisdom to design.

The power of self-existence cannot be imparted, consequently nothing created can for an instant exist without constant support from the infinite Creator ; for what can not exist from its own

power, exists only while so supported. Since God therefore extends His creative influence constantly into whatever is created, all forces and laws operative in nature, whether in living plant or creature, or in dead matter, are a constant extension of His creative power. And though the application of this power is in appearance mechanical, it is evident that the grand results are not the work of a machine, or of inanimate forces. Divine love and wisdom can not do less than send each iota of force upon a special mission; and each of these special messengers must thus proceed from the Infinite God, the I Am, the Life, whose glory is above the heavens (Ps. 113: 4), through the realm of spirit, into nature, where it produces its final, ultimate effect.

The scientist who limits himself to material things, and the laws therein operating, must therefore make at least as grave mistake as did the ancient astronomer, who studied the motions of the heavenly bodies from their appearance as viewed from the earth. True science can not ignore life or spirit, much less the uncreate, Infinite God as the First Cause. True science is true knowledge, and therefore it is not any less a part of religion than is faith. That is not faith which pretends, or tries, to believe that there is a God to whom all things are possible, even the changing of His own laws, but does not even make any effort to know Him and His manner of dealing with man and all things in nature. Living according to true science is therefore to exercise true faith.

When a person has therefore learned from nature, and the wonderful and incomprehensible character and power of the human soul, from the book of nature and the Book of Life, that there must be an Infinite God, science becomes the "Jacob's Ladder" to him on which his faith ascends and descends to prove the reality of all things. And when all men so exercise their faith, from the love of fulfilling the requirements of God's behest, the prophesy will be fulfilled, "For they shall all know me, from the least of them unto the greatest of them, saith the Lord." Jer. 31: 34.

MOUNT JOY, PA.

DOES PROHIBITION PROHIBIT?

BY REV. M. STONE, D. D.

The advocates of free whiskey often offer as an argument against legislative interference with that abominable traffic in intoxicating drinks, "that it is of no use to legislate against it, for such laws cannot be enforced." Say they, "Prohibition does not, never will, prohibit, and it is unwise to make laws that cannot be enforced." I propose to offer good reasons for dissenting from this opinion. If it is unwise to enact these prohibitory statutes because men will violate them, then it would follow that all criminal laws ought to be repealed, because men always have broken them. Almost all laws are prohibitory, even *nine* of the decalogue are prohibitory. There are a few mandatory civil laws, but the great body of legislation is prohibitory against murder, arson, treason, burglary, theft, robbery, forgery, counterfeiting, swindling, fraud, embezzlement, rape, adultery, polygamy, incest, and hundreds more; and all are violated, and always will be while fallen man remains what he is. There is no good reason against prohibition of this mother of all crimes, that would not justify the repeal of our whole criminal code. There are some reasons why the execution of a law against the liquor

traffic is more difficult of execution than others. 1st. Because men who will persist in such a ruinous business are unscrupulous enough to resort to the vilest measures to defeat the purposes of the statute. They will resort to bribes of the court and jury, they will pack the jury, they will hire lying witnesses, or spirit away or kill witnesses whose testimony they fear. They pay no respect to truth and justice, so far as their business is concerned. 2d. Because the patrons of the saloon will often sooner perjure themselves, than offend the man who furnishes their drink. They will swear that they never bought any liquor at his bar; they have often drank at his bar, but they never called for any whiskey, rum, brandy or gin at his bar. They have bought some sort of fluid by a score of other names, but none of those articles. The writer was once present at the trial of a liquor seller in Ohio in which thirty or forty who were habitual customers of that saloon, and every one swore that they never bought any of those articles at his bar. This is the common course of such witnesses. 3d. But the most weighty reason of all, why prohibitory legislation is a failure, lies in the painful fact that an intelligent and influential set of men called *lawyers*, for a fee, can always be found to enter into a conspiracy with liquor sellers against law and order, to defeat the purposes of the statute. They scruple at no trick by which they can succeed in protecting the man whose business furnishes riots, crimes, paupers, misery and burdensome taxes for innocent citizens. They well know the effect of their success, but what do they care so long as they can have the glory of victory, and a fee. There is no such great danger to our country as this professional interference with justice in our courts, not only in prohibitory measures against the liquor traffic, but against all penal legislation. Criminals know they have a refuge in that profession. If lawyers would utterly refuse to help rogues to escape punishment, crimes would be rare. Saloons would be closed in one month if it should become known that no lawyer could be induced to help him to evade the law. There would be no "dead letter" laws, if lawyers would faithfully stand by the manifest design of the statute, as they are as much bound to do as any other men. The "oath of an attorney" was never designed to justify a lawyer to become a conspirator with villains against the peace and safety of society. His duty to his client is done when he has defended his client against a violation of his rights. Our criminal justice is little less than a farce. Criminals of the deepest dye are turned loose every year by thousands, not for want of evidence of their guilt, but by the unscrupulous tricks of lawyers in packing, bribing or beguiling juries, spiriting away or bribing witnesses, or by ingenious sophistry, causing the jury to disagree and thus making a new trial at great expense, or a discharge of the rascal necessary, to avoid such a burden of taxes. These criminals go out emboldened by their impunity to repeat their crimes. The Star route thieves and the Cincinnati riots are witnesses of these impeachments of that profession.

If there is any propriety in penal legislation in any direction, then surely that against the liquor traffic stands above suspicion of wrong, for there are more evils to society than from any other source, in this murderous business. There is no one department of legal justice in which lawyers can inflict so serious a wrong upon society as by giving their influence to protect this traffic, and no department in which they could confer so great a boon upon society, as by making saloonists feel that no quar-

ter will be given to such miscreants. Murder and homicide are great crimes, but a very large share of these find their source in the saloon, and the protection of the saloons multiplies them. Robbery is a great crime, but how many families are robbed of their all by the saloon. The corruption of our youth is a great crime, but where are so many ruined as in the saloon? The lawyers, therefore, who protect the saloons become guilty sharers in these great wrongs, and ought to share the punishment that the law was designed to inflict upon evil doers and their accomplices and allies. Not all lawyers are *directly* guilty of these crimes against law and order, but those who would scorn this dirty work are *silent*, and allow the profession to go on with these vicious professional maxims of practice, not having the courage or boldness to demand a reformation, which they could very soon secure, if it were understood that a man could not trifle with public justice and hold any decent place among men. Such men as will consent to become the allies of criminals, should be disbarred at once. The whole responsibility of the failure of prohibitory legislation may be laid at the door of the law profession, for the laws are just and wholesome, and would secure society against these evils if they could be enforced, and they could be enforced if the law profession would take sides with the suffering community. The terrible scenes in Cincinnati of late will not stand alone if criminal justice cannot be better executed. The dirk, the pistol, the shot gun and lynch law are fast taking the place of legal justice.

OMAHA, NEB.

THE NEW CREATION.—No. 2.

BY ELD. J. J. MILES.

Paul declares: "If any man be in Christ Jesus he is a new creature." And again: "For we are His workmanship, created in Christ Jesus unto good works."

We wish to examine this subject in the light of acknowledged facts, the Substantial Theory, and Scripture.

That the mind grows, increases in strength, capacity and power by imbibing truths conveyed to it in words and by exercising itself, just as truly as that the body grows and increases in strength by eating food and by exercise, is a fact that no one will deny. If thoughts, truths, words are substantial, then the growth and increasing strength of the mind is no stranger a fact than bodily growth and increase of strength. Now Jesus expressly says: "The words that I speak unto you, they are spirit and they are life;" and "Man shall not live by bread alone" (this the body does), "but by every word that proceedeth out of the mouth of God." (This the inner, the spiritual man, does.)

Both science and Scripture teach us that creation is *progressive*. First, God, by the word of His power, created the heavens and the earth. Second. At the word of the Lord the earth brought forth grass, the herb yielding seed after his kind, and the tree yielding fruit whose seed is in itself after his kind. Third. From the seed yielded by these trees, herbs and grass, all the subsequent trees, herbs and grass have sprung by the same power of God. Just so in man's case, creation is progressive. First, God created the earth. Second. The Lord God formed man of the dust of the ground and breathed into his nostrils the breath of lives. Third. Out of man God made woman. Fourth. And God SAID unto them, Be fruitful and multiply, etc. Thus by God's word, from the

first pair all human beings to this day have sprung; and we can truly say to-day, "THOU hast made us and not we ourselves." One creation is grafted upon another, springs out of another by the word or power of God.

Just so upon the progressive method of creation, spiritual life is grafted upon the natural life, springs up out of the natural life through the word of God. Before spiritual life is implanted, man has physical and intellectual life. His ears can hear, his eyes can see, his mind can understand, his affections can feel, his conscience can approve the right and condemn the wrong, his emotions can kindle, his will can resolve and his whole body can act. Now, the word of God, the preached Gospel (Peter declares) is the incorruptible seed of which one is born again. Says James: "Receive with meekness the ingrafted word which is able to save your souls." The preacher is the sower, the word of the Lord or the gospel of Christ is the seed, the heart or mind is the soil. "He that hath ears to hear, let him hear." The natural man receives with meekness this word of God into his understanding, cherishes it, obeys it, a new born creature or new creation is the result, just as, when living seed is received into the soil, a new born plant, a new creation, springs out of the soil.

Now if the word of God be a substantial entity, a living entity, just as the vegetable seed is a substantial living entity, what a beautiful uniformity do we see in God's manner of working or creating. In this view of the case, the natural or intellectual man has it in his power to receive or reject the word of God. He can be created anew, have a new life spring up, a new spirit of mind, by simply hearing, believing and obeying the gospel. The living seed deposited in the soil has to have God's sunshine, heat, electricity, moisture, etc., which God (and He only) supplies when man does his part, plants the seed; and the life of the seed is from God. Just so the life that is in the Gospel seed is from God, and when man on his part complies with the essential conditions, receives the word with meekness, obeys it, God does his part, imparting spiritual warmth, sunshine, electricity may I say, all that is necessary to make the living seed grow. I see no more mystery in one case than in the other. All life is an inexplicable mystery, as far above man's power or comprehension as any miracle recorded in the Bible; but the conditions or means by which new creatures are born is no mystery. It is as simple a matter to receive the truths of the gospel into the understanding, affections, conscience, and obey them, as it is for the soil to receive vegetable seed into it and nourish it.

And not only is the new creature in Christ Jesus the result of the incorruptible seed, the gospel gladly received, but Peter adds, "As new born babes receive the sincere milk of the word that ye may grow thereby." What a beautiful sameness in the works of God, whether we view the vegetable, the animal, the intellectual or the spiritual kingdom! And how beautifully the Substantial Theory harmonizes with universal human experience, and with Scripture teaching concerning the new birth or spiritual creation and spiritual growth! And it leaves man a free moral agent, an accountable creature, who can have new life and grow into spiritual manhood if he will.

CLINTON, ILL.

☞ This is the last number of Vol 3. Let each reader, who approves of our work, not wait for an agent, but remit the \$1 for Vol. 4 at our risk. If you do not want Vol. 4, please notify us.

EXTRAORDINARY CONCRETIONS.

BY REV. PROF. STEPHEN WOOD.

I wish to call the attention of the readers of THE MICROCOSM to the very wonderful formation of concretions found within the counties of Franklin, Delaware and Morrow, in Ohio. Similar concretions are very common in this part of Iowa and are always calcareous, so far as I have observed, and always spherical in form, and generally about one inch in diameter. Dana, in his text book of geology, speaks of them as being in size as large as peas or bullets, and others a foot or more in diameter. He says: "Concretions are usually globular in sandstone, lenticular in laminated sandstone, and flattened in argillaceous rocks or shales." Those in Ohio, above referred to, are, so far as I have observed, all globular. They were formed in the thick bed of shale (a brown argillaceous formation) and are exposed at the outcropping of these rocks, in the counties mentioned. They are of widely different material; some of them carbonate of lime; others dolomite; others ferruginous. Calcareous matter usually predominates with more or less of siliceous and argillaceous matter.

I saw one about seven inches in diameter, in the possession of Prof. Merrick, former President of the Wesleyan Ohio University, at Delaware, Ohio, that seemed to be nearly pure iron; it was possibly, a sulphuret of iron. They are in number almost innumerable, and are of all sizes up to ten or twelve feet in diameter. This heavy bed of shale above referred to, is the matrix in which they are formed. They grew by accretions; and it is not uncommon to find in the centre of large concretions, a bone, a knot of hard wood, or a small shell which served as a nucleus around which the matter collected. In the centre of some, a mass of crystallized spar (the double refracting) is found, which has probably taken the place of some substance which had disappeared, leaving a cavity in which crystallization took place.

They grew by accretions drawn from the shale surrounding them, and as they grew, the shale was crushed in all directions; not converted entirely at first, but certain elements were probably withdrawn for the formation of the concretion, and what remained was more easily crushed and moved out of the way. Those found upon the surface are in places where the shale has been exposed, disintegrated and more or less removed.

We have no account of concretions in any part of the world so large or as numerous as at the place referred to. If there is any reader of THE MICROCOSM who resides in the region, and would give more particulars in reference to them, or correct these which I have given, if they need correction, I think it would be very interesting to the readers of your Magazine.

In crystallization there are different laws of formation, each substance having its own form and shape; but these concretions, are evidently of various substances and all similar in shape.

It seems that in these concretions natural shape is not the result or termination of form.

LOST NATION, IOWA.

IS MEDICINE A SCIENCE?

BY REV. D. D. SWINDALL, D. D., M. D.

Ed. Microcosm :—As your paper is for the free discussion of all legitimate subjects touching science, and as there has been going on for about a

year, a discussion between Drs. Cronin and Bowie, on the subject of medicine, I now propose, by your permission, to come in as a third party, to settle the controversy.

FIRST PAPER.

In this paper I shall pay my respects to Dr. Cronin; or, rather, I shall test his declaration to Dr. Bowie, where he calls his system of medicine scientific. This I positively deny. I antagonize it thus: The allopathic system of medicine is *not* scientific. Now, contrary to the requirements of logic, I proceed to prove this negative. I submit in evidence the following:—

1. *The name allopathic.* Names are expressive of the nature or character of the persons or things of which they are the appellatives. The word allopathic is of Greek derivation, thus: *allos*, other; and *pathos*, morbid state or condition. Hence, *allopathic* means another morbid diseased condition.

2. *Allopathic law of therapeutics.* This law or principle is, to make another disease in the place of the one already existing. In proof of this, I introduce testimony from the highest allopathic authorities. Prof. R. Dunglison, in his therapeutics, says: "Our agents are resorted to with a view of exciting a *new disease* in the place of the one already existing." Prof. G. W. Wood, Ther., vol. 1, p. 55, says: "If we can produce a new disease in the exact position of the one that may be existing, we may possibly supersede the latter; and if the new disease subside without injury, we cure our patient." *Make disease to cure disease!*

3. *Their medical agents.* These are 1, *poisons*; and 2, *narcotics*. Some articles combine the two properties, corroding or abrading first, and afterwards making a narcotic impression. Corrosives act on purely chemical principles, seizing upon the tissues, taking them from under the control of the life-force, and resolving them into dead compounds in conformity with chemical laws. E. g.: sulphuric acid will attack any tissue of the body, force out the vital principle, and then dissolve the structures precisely as if the life-power had not recently been in possession.

2. *Narcotics.* These do not cause any immediate and palpable corrosion of structure; but they abate the vital sensibility of the tissues, and lower the nervous property of feeling till they destroy it altogether. E. g.: carbolic acid gas first impairs the senses, then produces stupefaction, and presently leads to somnolent death. But to particularise. *Poisons.*—Definitions. Dr. Gardner, allopath, in his Medical Dictionary, says: "That which, when applied externally, or taken into the human body, uniformly effects such a derangement in the animal economy as to produce disease." As typical of the whole tribe of poisons—as used by allopathic physicians—I present calomel—subchloride of mercury. It was first employed by the Nubian physicians, Avicenna and Rhazes, against vermin. To the renowned empiric Paracelsus—the true father of allopathy as it now is—may the honor (?) be given of first recommending its internal use as a medicine. Prof. T. Graham, of the University of Glasgow, and member of the Royal College of surgeons in London, says of calomel: "There is not in the materia medica another article which so immediately and permanently, and to so great a degree, debilitates the stomach and bowels, as calomel." Hooper says: "All our most valuable medicines are active poisons." Of the effects of calomel, Prof. Harrison testifies as follows: "It produces rapid sinking of the vital powers; palsy, ulceration, and disease of the bones; irritates the heart and arteries and invariably depresses the nerves;

demolishes the very pillars of human health ; produces incurable diseases, etc." N. Chapman, Prof. of Materia Medica in the university of Penn., "O, the lamentable ignorance which dictates the use (as a medicine) of that noxious drug, calomel. It is a disgraceful reproach to the profession of medicine ; it is *quackery* ; horrid, unwarrantable, *murdering quackery*." So much for calomel.

2. *Narcotics. Opium. Its alkaloid—morphia.* As morphia is the preparation of opium which is now so extensively used by poisoning Drs., I take it as a representative of the whole tribe of narcotics. *Its morbid effects.* A very small dose will sometimes produce convulsions in a very young patient. Half a grain of Dover's powder—which is the twentieth part of a grain of opium—will induce fits in a delicate child. Christison says : "An infant got, by mistake, about fourth part of a mixture, containing ten drops of laudanum, and died in twenty-four hours. The administration of three drops of laudanum to a stout child, fourteen months old, was followed by convulsions and death in six hours." Prof. J. P. Harrison says : "It stupefies for a while, and forces the child into an unnatural sleep. It enhances nervousness. If the brain is affected, it increases the disease. It is hurtful because it is contrary to nature. It is a medicine—a foreign substance, which nature does not call for or kindly receive while she is in her right mind." Paragoric, Batesman's Drops, laudanum, Dalby's Carminative, Mrs. Winslow's Soothing Syrup, or toddy, lays the foundation for head complaints, such as inflammations, convulsions, and dropsy of the brain. Prof. Gallup says that it has done seven times the injury that it has rendered benefit on the great scale of the civilized world.

There is no telling the amount of injury to the human family that has been done by allopathic doctors, by these poisons and narcotics. They are not disease *curers*, but disease makers. Hence the allopathic system of medicine is not scientific.

Syllogism:

1. No disease-making system of medicine is scientific.

2. The allopathic system is disease-making.

3. Therefore, the allopathic system is not scientific.

D. D. SWINDALL, D. D., M. D.

BERNADOTTE, ILL.

IN WHAT SENSE AND TO WHAT EXTENT IS CONSCIENCE OUR GUIDE?—No. 2.

BY REV. JOSEPH SMITH, D. D.

(Concluded from May Number.)

All alike start in life on the same level as the deaf mute, ignorant of their own immortality, ignorant of the being of God and their accountability to Him; and would doubtless live and die in this moral darkness, unless taught otherwise.

Nor does even the light of the Gospel prevent the conscience from exhibiting much the same freaks and frailties as in Heathen lands. On how many points was the conscience of the Pharisees directly at issue with that of Christ and His disciples? What an endless disagreement between the conscience of the Papist and the Protestant, the errors being as firmly and conscientiously held as the truths. For though their leaders may often "teach lies in hypocrisy," yet the ignorant masses receive and hold them all as the truths of God.

But these perversions and conflicts of conscience are not confined to the ignorant in Christian, more than in Heathen lands. The learned and the cultured differ quite as widely as others.

While one theologian conscientiously holds to

the native depravity of man, another rejects the idea as an abomination. One accepts the doctrine of the incarnation as a glorious truth, while another condemns it as a wild superstition. The doctrine of the atonement commends itself to the moral sense of one man, but another regards it as embodying both an absurdity and a crime.

While one holds prayer to be both a privilege and a power, another believes petition, and especially intercession, to be not only a useless service, but a gross impertinence. Indeed, there is scarce a single principle in the whole range of religious faith and practice on which the learned have not held different and conflicting views, and that too, with as evident sanction of conscience as Pharisees and Christians held their oppugnant sentiments.

Thus erratic and unreliable is the conscience, when not duly enlightened and controlled by the truth and Spirit of God. With equal firmness it holds truth and error, the affirmative and the negative of almost every question pertaining to God and His service—to man and his interests.

To such extent do self-interest, education, custom and other influences shape and control the conscience, even on the most common questions of morality, that many philosophers have denied the existence of a natural conscience, regarding the conscience as wholly the result of education. But admitting the native character of the moral sense, and its special aptitude for ethical truth, yet what it would be, if wholly without instruction, we have little means of knowing.

As without instruction, we should be ignorant of our relations and duties to God, so if wholly without instruction, we might be equally in the dark, as to our relations and duties to man. But having endowed man with a moral sense, God has not failed to furnish means for its education.

We learn from the Bible that various revelations were made to the ancestors of the race, teaching their relations and duties to both God and man. And these truths, more or less obscured and distorted, have been preserved in the traditions and ethics of Noah's descendants. Nor is it improbable that these truths have been revived by later revelations, even among heathen nations. Such men as Confucius, Gautama, Zoroaster, Mohammed, and others who have been raised up to correct the views, and reform the morals of their people, though less enlightened than Job, and Elihu, and Melchisedec and some other Gentile seers seem to have been moved by a divine impulse, and furnished with new light from above, by which they were in some measure, able to relieve the darkness settling down upon the nations.

And it is these revealed truths, embraced by their moral sense, that give any reliability to it as a moral guide.

The native conscience being so dim-eyed and so easily perverted, discloses the necessity of a fixed and reliable standard of ethical truth. The myriad varying time-pieces of the world no more need a fixed astronomical standard by which they may be regulated, than do the equally erratic consciences of men need a true standard, by which their sentiments may be tested and their errors corrected.

And what we so sorely need, God has attempted to furnish. And as He is not likely to make a failure in what He undertakes, we may safely conclude that He has given us one that is perfectly reliable, and perfectly suited to our wants. It not being needful that we should know everything, God has not attempted to reveal every-

thing. But He informs us that He has aimed to reveal everything necessary to make "the man of God perfect, and thoroughly furnish him to all good works." Then if God has accomplished what He has tried to do, the Bible is not only a *reliable* standard, but a full and complete standard fitted to make the man of God *perfect*.

Revelation does indeed sometimes touch on deep things, and hard to be understood. Yet if God has not made a failure in His effort to meet our wants, the honest inquirer, by due care and candor and the Spirit's promised aid, will not fail to find there everything necessary to guide him into all needful truth.

Indeed the Bible is a perfect thesaurus of spiritual truth. There is no recognized spiritual truth in the religious world, which is not taught in the Bible. Nor need we expect to discover any additional truth, which is not also contained in the Bible. If more truth is yet to dawn on the world, it must break forth, not from the conscience as some suppose, but from the word of God; for the conscience has nothing reliable which it does not receive from God's revealed word. As God has given us a complete standard of truth, fitted to make the man of God *perfect* the Spirit has no occasion to reveal any new truths, but needs only to aid us in reading the Scriptures more correctly, and discovering more of the depths and fullness of their meaning.

And as God has given us such a standard, we are under the highest obligation to accept it as our guide in all matters of right and duty, and carefully to conform our conscience to its teachings. But many think themselves so wise that they can dispense with the Bible—believing their consciences, or as they express it, their best judgment to be a better guide than the Bible. But by what means have they become so wondrous wise? How does it happen that their consciences are more enlightened than that of the Hindu who worships a cobra or a monkey? Where did they get their superior knowledge? It has come directly or indirectly from the Bible which they so arrogantly cast aside. Had not they and their fathers enjoyed the light of the Scripture, they too like the Hindu, might be worshiping snakes and monkeys; or like the more polished Grecian, worshiping deified adulterers, drunkards, and courtesans. Their wisdom is well matched by that of the rustic, who declared that the light of the moon is of more importance to us than that of the sun, for he said that in the day-time we could see well enough without the sun. But what makes the day, except the sun? And from what comes the superior light of Christian lands, but from the Bible? And the folly of making the conscience our standard, is the more obvious, in that its decisions do not long remain the same. Its state is constantly changing for better, or for worse. It improves under a close and prayerful study of the Scripture. But if one profess to follow his own speculations or wishes, or the theories of favorite authors, his conscience will become more darkened and astray. Hence, it is that men are drifting hither and thither on the different currents of thought, and according to their bent, respectively embracing Unitarianism, Universalism, Swedenborgianism, Spiritualism, Ritualism, Popery, Pantheism, Materialism, Agnosticism, or Atheism; while others under different influences, are passing from each of these views into Evangelical sentiments. And Evangelical Christians are often passing from one sect to another, each following the dictates of his conscience, thus showing how entirely unreliable is conscience as

a guide. Nor are superior talents and scholarship any security against any such erratic movements, for the talented and the scholarly are mainly the leaders in these theological migrations. And yet, notwithstanding all these freaks of the conscience, there are those presumptuous enough to subject the Bible to the standard of their consciences, and accept or reject its teachings according as their consciences approve or disapprove its sentiments. The modesty and wisdom of such a course is about equal to his who should presume to regulate the sun by his watch, instead of regulating his watch by the sun. As God has given us a standard of right and duty, so full and complete as to make the man of God *perfect*, and *thoroughly* furnish him with *all good works*, there is no need that we should be ignorant of our duty, at least in all matters of importance. We have only to seek for the light with due prayerfulness and candor. To such God has promised to give wisdom liberally. If however, through pride, or prejudice, or self-will, one refuses thus to test his principles lest he should find himself wrong, and have to give up cherished views and practices, or have to perform unpleasant duties, so much the worse for him. If one's conscience is wrong, it is his first duty, not to follow it in wrong-doing, like Saul of Tarsus, but to set it right. God has placed within our reach the means of finding the light, and every hour we neglect this means and follow our perverted consciences to do evil, we are practically despising God's appointed means of grace, and augmenting our guilt. It is not enough that one can say that his conscience approves of his course. This by no means settles the question. But does God approve it? Does the Bible sanction it? Crocket's favorite aphorism is the true one for every man to follow. We should first "be sure we are right" before we attempt to "go ahead." What God requires is not simply *action*, but *right action*. We should therefore try every principle as well as "every spirit," not by the erratic conscience, but by the Spirit's standard, the word of God, that "sure word of prophecy whereunto we do well that we take heed." The Scripture direction is, "To the law and to the testimony, if they speak not according to this word, it is because there is no light in them."

The voice of conscience then is *not* the voice of God. It is not God speaking *through* us, but is only that to which God addresses His commands, but which may be so seared, or so perverted as not to apprehend, or be influenced by His commands. We may indeed follow the dictate of conscience in a given case, but not, however, simply because it is the utterance of *conscience*, but because we know it accords with the word of God, for under altered circumstances, it would give a very different decision. While the moral sense is so liable to be deceived and its views so often changed, it evidently is unfitted to be our standard. But the word of God, like God Himself, is true and unchanging. And it is only when we know that our feet are planted on this rock, that we can be certain that our principles are correct, and that our foundation is sure.

BANGOR, ME.

THE SUBSTANTIAL PHILOSOPHY AND THE BIBLE.

BY J. W. LOWBER, M. A., PH. D.

The Substantial Philosophy not only harmonizes with the Bible, but it is, really, taught in it. The advocates of this *new* philosophy are Bible students; and they find that God's word clearly

teaches Substantialism. As lovers of the truth, they lay aside preconceived theories; and study, impartially, the *great volume of Nature*. They soon find that God's will, impressed upon Nature, substantiates the true Substantial Philosophy, which is revealed in the Bible.

When God created man, He breathed into him a portion of his own spiritual essence; and man became a living being, possessing animal, intellectual and spiritual life. Man is a duplex being, one man living in another man. The outward man, we can see; but we cannot see the inward man. The inward man, however, is more substantial than the outward; for though the outward man perishes, the inward man is renewed day by day. Man can kill the outward man, but he cannot kill the inward, or the soul.

Jesus teaches us not to fear him who can kill the body, but cannot kill the soul; but, rather, to fear Him, who has power to destroy both soul and body in hell.

The apostle Paul recognizes the *substantial* in the things not seen. He teaches that the seen things are temporal; while the unseen things, are eternal. We are, therefore, to look not to the things that are seen, but to the things that are not seen. This language appears paradoxical, but it is not, for the same God who has given us outward eyes to behold outward things, has, also, given us inward eyes, by which we can perceive things spiritual and eternal. We can look, with these inward eyes, to that which is most substantial and durable. The truly substantial is something more enduring than flesh and blood, than sky or air, earth or sea.

In this world, the most substantial and enduring things, are those which we cannot see. Oxygen, hydrogen, nitrogen and all simple forms will ever remain pure and incorruptible; for we cannot think of the annihilation of the ultimate forms of matter. If the skeptic wishes the eternal, he must cling to the unseen, even in Nature. The apostle is perfectly scientific, when he declares the unseen things to be eternal.

The stronger our convictions become with regard to things not seen, the less real the present becomes; and the unseen becomes more of a Positivism. Men have been so much in the habit of calling the future state unreal because spiritual, and unsubstantial because invisible, that the people now look upon future existence as a kind of dream-land. The reason why the character of Christ has so written itself upon the face of civilization, is the fact that its chief element was his faith in God and the future state. Christianity places man upon a border land, with two natures capable of inhabiting two worlds. The margin between them is indeed very narrow; it is like the colors of the rainbow, we cannot tell where one ceases and another begins. The body is conditioned, and confined to this world; but the mind may live in the other. It may long for a better home than this world can give, and desire to depart and be with Christ.

Our Saviour promised his disciples that he would go, and prepare a substantial home for them. Its location was to be in a magnificent city, ornamented with the most costly and beautiful jewels. The house would contain many mansions, suited to the wants and capacities of all. Paul knew that God had prepared such a building for his people; and he was ready for the present tabernacle to be taken down at any time. Man's future home will be substantial; the body in which he will live will be spiritual and incorruptible, and the Substantial Philosophy will be the *Philosophy of Heaven*.

LOUISVILLE, KY.

PRAYER—WHAT ITS OBJECT, AND HOW IT BENEFITS.

BY MRS. M. S. ORGAN, M. D.

In the investigation of every question pertaining to the interests of man, it is absolutely essential to the elucidation of truth, that he should be studied in his dual nature of material and immaterial substance. The relation which he sustains to the material universe, the influence which it exerts upon him, the reciprocity existing between mind and body, must all be taken into consideration. The elementary faculties which constitute his immaterial substance (or mind) have a correlated as well as an independent action, and between the independent and associated action of these faculties, and his material substance there is a mutual dependence. Therefore, to study man as a subject of physical, mental, political, moral or spiritual science, singly or apart, must inevitably result in falsity. It is because this method of study has ever been pursued that the world has been filled with such controversies and antagonistic theories concerning man's nature, interests and duties; and therefore without that definite and indispensable knowledge to guide, he has made such slow progress in physical and mental development.

Whatever may be the conviction as to what constitutes the mind or soul of man—whether it be an immaterial substance, a sublimated form of matter, or an indefinable principle—all must coincide in the practically demonstrated fact, that it resides in, and acts through, the organized matter of the brain, precisely the same as if it were a property of that vitalised substance; and is subject to the same laws as those which govern the power and manifestation of vitality.

Every organ and part of the body grows by assimilating those elements of food which are constitutionally related to them. The growth and development of the faculties and instincts of soul are exactly analogous. Every faculty and instinct of soul is constitutionally related to some object, element, or principle existing in the universe of matter or mind, which incites it into action, and from which it obtains nourishment necessary for its growth and unfolding.

The very existence of such faculties, absolutely necessitates complementary elements or principles as food; for nutriment to the soul, is as nutriment to the body, a normal excitant to action—to life. And in the boundless storehouse of God there is provided an inexhaustible supply of all that the soul requires for its highest and best development.

Having before us these basic principles, we are enabled to comprehend the true philosophy of influences and powers that have been considered undefinable and mysterious, and which for man's highest well-being should be understood.

In the religious world there is no one act that is considered more potent for good, than prayer. What is the object of prayer? and how can it benefit? are questions that have never been sought to be answered from a philosophical or scientific standpoint. Indeed, it would be deemed sacrilegious to bring in the aid of science, to discuss such questions.

But what is science but the intelligent and methodical unfolding of laws, which govern the elements and forces in the material, vital, and spiritual world?

Would it be in accordance with Deific wisdom to ordain fixed and immovable laws to govern the material world, and yet leave the grandest

and infinitely most important part of His creation—the soul of man—a mere chaotic force, governed by no fixed and determinate laws? Reason rebels against such a reflection upon Creative wisdom. As we cannot bring the forces of the material world into such combination and action, as to secure beneficial results, without a scientific knowledge of their *modus operandi*, so, neither can we secure the highest benefit from the action of moral and spiritual forces without a correct understanding of the laws which govern them.

The dominant ideas prevalent in regard to prayer, are first, to propitiate the Deity by homage and supplication, and second, the blessing to be secured to the individual. If we carefully trace the underlying principle indicated in the first, we will find it but the ethical expression of the animistic concept which actuated the mind of primitive man. God is recognised as an all-powerful being whose attributes are imaged in man, and, reasoning from analogy, a concept is formed that the mind of Deity will be moved by the same motives and influences; His anger is sought to be averted and favor propitiated by homage and humble supplication.

This idea has exerted a most pernicious influence and has been one of the greatest hindrances to man's spiritual advancement.

Looking to God and expecting Him to perform for individual benefit and the welfare of humanity, that which lies within man's own power, and which is his obligatory duty to perform, takes away the feeling of human responsibility, and with it one of the strongest motor powers for moral action; for responsibility is a moral stimulus—the great moral lever for individual and race elevation.

God has endowed man with mental and moral powers of soul, and He has provided food to answer their requirements to the utmost, but the effort, the labor to secure this food is man's. And God's explicit command through revelation, as well as through the laws of man's mentality, is, "knock, seek, and ye shall find." "Work out your salvation," etc. The constitutional nature of man's mental organism as revealed through physiological and psychological law, most conclusively demonstrate that the intent of prayer, or rather the benefit to be derived from it, is solely a moral and spiritual benefit to the individual.

Prayer is but the effort of the soul reaching out with an earnest longing for spiritual food and drink—it is the spiritual nature incited into action, and through this action it increases in power; for the spiritual faculties, like all other faculties of soul, like every organ and part of the body can only develop strength and vigor through action; and the more any faculty or part is exercised within normal limits, the more vigor and power it will acquire,

Thus by a continued exercise of the spiritual nature, it will attain such power that it will become the soul's arbiter; its influence will direct the life, restrain the lower propensities and keep evil impulses in abeyance. Man, by thus obeying the harmonic design of the soul's organic laws, will approximate nearer and nearer to that symmetrical and refined type, which will characterize the perfect man. Every longing of the soul for truth, every desire for purity, every aspiration for a higher life, every sacrifice made for the good of others, every struggle to subdue evil propensities is a prayer—prayer in its deepest and truest import and efficacy. When life is a constant endeavor to fulfill the grand object of existence—to approximate nearer and nearer to the essence of all good, then, in letter and spirit we are

following out the injunction of Paul—"Pray without ceasing."

In conjunction with the strength acquired through the action of the spiritual faculties, is that obtained through the reflected or impressive influence which comes through a direct communion with a God of benevolence, justice and purity.

When in the social intercourse of life, we come in contact with a pure and elevated mind, we feel all the better impulses of our nature quickened into intensified action.

So, in a higher and more spiritualized sense, communion with God inspires and uplifts the soul, baptizes it with a spiritual fire, and leads it through the green pastures and beside the still waters which lie very near the throne of the Infinite Father.

When man once comes to have a practical realization of the fact that the laws which govern the moral and spiritual universe, are just as fixed and determinate as those which govern the physical—that no prayer, no supplication can influence Deity, or cause Him to deviate from laws which He has established—that the only way to secure His blessing, is to place himself in harmony with these laws—a great and ennobling impetus will then be given to the soul's advancement, the twilight streakings of that longed-for millennium will brighten the moral and spiritual horizon, and the kingdom of God will then be established in the human soul.

NEWBURGH, N. Y.

THE CHRISTIAN STANDARD vs. THOS. MUNNELL.

[The following is the reply of the *Standard* to Eld. Thos. Munnell's Second Response, as printed in last month's *MICROCOSM*.]

The wave-theory of sound, to which our scientific brother objects, teaches that sound is a sensation made upon the organs of hearing by rapid tremors or undulations in the air. Since the noise of a locust or the sound of the human voice can be heard a mile in all directions, it follows, according to this theory, that our vocal organs or the locust's wings, by vibrating, can send 440 tremors in a second through this entire mass of air, whose weight is figured at 20,000,000 tons. This is the locust problem; and it is declared that this feat would require more than "the strength of one hundred manilla cables"! Yet it is said that this is not Mr. Hall's "chief objection"! If true, what can be chiefier than that? The fact is, our investigator is weakening on the locust problem. He now sees that all the air in question, as well as all the air surrounding our globe, is practically weightless, *when operated in its own element*. The same is true of water and quicksilver. A pound of pressure will move millions of tons of these substances *in their own element*. Draw from the bottom of a sea of air, or water, or quicksilver, or any other gas or liquid, one pound of the substance in question, and the entire sea *must* move to fill up the vacant space. Of course at either coast the motion would not be rapid—not more rapid, perhaps, than our reviewer's still sounding fork, whose motion is declared to be "a demonstrated velocity of only one inch in two years"! A locust could bring up the requisite pound, and shake an ocean of quicksilver. Besides, when our critic acknowledges that these three elements are "equipoised" and "press equally in all directions," and *gives that new law*, he opens the way for us to say that an ounce of pressure, added in any direction, will start uncounted tons of "equipoised" liquids!

or gases, in the other direction, whether they are suspended and equipoised in their own element or "in vacuo." Let us see. Suppose one million tons of air, or water, or quicksilver, were "freely suspended in vacuo" to each end of a giant pair of balances, and thus "equipoised" to perfect rest. Now place upon one end of the balances an extra ounce of pressure, thus destroying the *equipoise*, and *that end will go down, and the other end will go up.* All the *inertia* in the whole world cannot hinder it. A locust's dead body is sufficient to destroy in this way the *equipoise* and move 20,000,000 tons. These tons thus suspended and equipoised *in vacuo* could be moved up and down with as much rapidity and with as little effort as when two boys play see-saw on a rail over a log. And as, *according to our critic's new law*, "the resistance of any surrounding liquid element to the displacement of a given quantity of its own material, is *exactly equal* to the resistance from inertia of the same quantity of the same material if freely suspended in vacuo," it follows that the resistance of the surrounding liquid "can not hinder 20,000,000 tons of its own material from moving, when urged to do so by the slightest pressure in any given direction. This is the fact. This is in accordance with our brother's *new law*, which is written better than its author knew. That *canon* is a *canon*, and its maker has fired it while standing at the wrong end. That gun is sufficient to shake all the liquids and gases in creation in one shot. One ball from that instrument dropped into the ocean will disturb its waters from coast to coast. That *canon* hits "*substantialism*" full in the face. Yet the discoverer of the one is the maker of the other! The reader is asked to notice what our gunsmith will do with that fire-arm.

Having almost abandoned the *weight* of the air as an obstacle, our Substantialist, in his former article, sought refuge in the supposed *difficulty* of "sudden displacement," declaring that "to suddenly overcome the inertia of a mass of suspended matter, and repeat this displacement hundreds of times a second, would be an almost infinitely greater task than displacing it in one direction by a steady pull." Yes; he says all this right in the presence, and against the protest of his own sounding tuning fork, vibrating before his eyes, 440 times a second—during 240 seconds—105,600 vibrations in all—as the result of one little tap! Our illustration of the vibrating bell, the vibrating piano-strings, and the wings of the gnat, which make 35,000 vibrations in a second, show that rapid vibration is not a difficult task, when dealing with such material as brass and steel and wings, and also *air*, since the air must vibrate with the brass and the steel and the wings. As no reply to this was possible, our scientist admits that "15,000 movements by the gnat in a second are *EASILY* accomplished!" and that "sonorous bodies, such as the bell and piano-chord, also vibrate *EASILY* by a natural law of tension!" So then it is now confessedly *not so*, that "to suddenly overcome the inertia of a mass of suspended matter, and repeat this displacement hundred of times a second, would be an almost infinitely greater task than displacement by steady pull." It is now "*easily*" done!

This is giving up the issue. If it is replied, as hinted, that this is true only of "sonorous" bodies, we ask, is not air as *sonorous* as the wings of a gnat? Besides, most men know that *elastic* substances like the air vibrate most easily.

So this little scheme touching the difficulty of "sudden displacement" has run its course. The

weight trouble is gone, for the air is confessedly "equipoised." The *vibrating* difficulty has passed away on the prongs of a tuning fork and on the wings of a gnat. "The resistance from *inertia*" has been weighed in the balance and found unable to withstand an ounce of pressure. In utter desperation touching the matter of vibration, our critic says: "This is not the point," and asks that we have a young lady "imitate the locust by striking the piano-key 440 times a second"! Ah! when did *that* come to be the point? How did that issue become involved in the wave-theory? Is the issue between the strength of locusts and a lady's fingers? A lady can vibrate her vocal chords at a rate, surpassing the locust's wings; will not this suffice? What remains now to block the way of sound-waves but the two million tons of hypothetical drum-skins!

It is still claimed that the strength of the locust must be measured by the weight of all the ear-drums that can be swung within the circle of the sound it produces, since its sound-waves are capable of shaking an ear-drum at any point in the way, *whether the ear-drum be present or not.* The man that *originated* that—well. Well, he ought also to believe the conclusion in the following illustration.

He himself can throw a stone 100 feet with a force sufficient, at any point in the way, to vibrate a suspended pane of glass weighing 100 pounds, *whether the glass is present or not.* Now, as 12,000 such panes of glass can be placed side by side in a hundred feet of space, let us multiply 100 pounds by 12,000, and this will give us 1,200,000 pounds as expressing the strength of our Substantial philosopher! This is the philosophy of the ear-drum sophistry repeated in glass, for the sake of transparency. Our shot-gun illustration was exactly similar. Our brother's futile efforts to reply by increasing the number of the guns and repeating the shots so that in their din and smoke our row of shingles, 24,000 in all, *might not be seen*, is very amusing—very. Most men will be able, however, to see, notwithstanding the smoke, that we will just multiply the number of the shingles according to the number of the guns, and repeat our demand for apertures at every shot! The *ratio* remains the same—24,000 shingles for every gun!—six hundred feet of solid timber pierced at every shot, *or a force equivalent to that.* It is about time our archer was seeing this. But the amusing part of this matter is, that after worrying with his guns to get them to go off with sufficient frequency he just confesses that they will not pierce the 600 feet of solid timber!—that "they would all expend their force upon a very limited shell of the blocks near the gun!" Just so. Besides, it is well to notice that when *proving* the power of his ten thousand guns, he only weighs *ONE SHELL* of the one hundred pound blocks, "near the guns," but when testing the power of our locusts, he weighs *twenty-one thousand one hundred and twenty shells* of the drum-skins! He is evidently fearful of over-straining his guns. He declares that:

Such a gun must evidently exert the same mechanical force upon the *air* or a displacing force of 100 pounds, no matter whether the 100 pound block is in range to be hit or not.

Why, then, does he not weigh *all* the blocks that can be placed on end side by side within the range of his gun, or guns, as he weighs *all* the ear-drums within the range of the locusts? Why confine the calculation to *one shell* in the one instance, and extend it to *all the shells* in the

[The following is the text of Ed. Munnell's third response, verbatim, as it was originally written, but the Office Editor of the *Standard* peremptorily refused to give even one half as much space, notwithstanding he has room in his paper for pages of matter of trivial importance in comparison. On account of this refusal Ed. Munnell was obliged to rewrite it, reducing the answer to less than one half the space, thus necessarily curtailing its value, deeming this as better than having no reply at all to the critic's sophistries for the sake of the *Standard* readers. We are glad, therefore, that the Office Editor of the *Standard* has room for the cause of science, that the *Microcosm* has room for the reply as it was originally written.]

In reading the Editor's reply to our second response, we confess our surprise at the trivial and weak character of the various attempts made to break the force of our arguments on the local problem, though the critic no doubt thought that some of his objections and illustrations were unanswerable. Such a natural misapprehension results from want of a correct understanding of the Substantal Philosophy, as will be apparent to the reader in a few moments. To show that we mean seriously every word we say, we promise now to take up his arguments, difficulties, and illustrations, in the order of their apparent importance, and to crush them piecemeal, so that nothing he may say in the future, bearing on Wilford Hall's theory, will make the slightest impression on the mind of the reader. Watch us closely and see if this promise is not kept to the letter. And to make our response the more effective, we request the reader before proceeding further, carefully to re-examine our last response and the Editor's reply.

His first, and in fact most plausible reason, for supposing that a locust could move 20,000,000 of air, water, or quicksilver, or bend untold millions of tons of cartrains in the act of stridulating, is that a locust could draw a pound of water from the bottom of the ocean, and thus move the entire ocean from coast to coast, in order to fill the vacuum thus produced. Although it is not true that a locust could draw up a pound of water as described (a heavy discount upon 20,000,000 tons!), or even a single ounce, yet we will easily fully admit that the whole ocean might easily move, if it were needed, to fill such vacancy. But what would thus move the ocean? Can the critic tell? No; it has never entered his head. Would it be the strength of the trilling pull which drew up the water? By no means; and strange that a scientific thinker should have conceived such a self-manifest impossibility. The force which would thus move the entire ocean is the *mighty mechanical power of gravity* which is constantly drawing with tireless energy upon all parts of the ocean's mass, pressing its atoms together from all directions, thus instantly filling any vacuum however produced. This same force is now moving the ocean from coast to coast, twice every day, in the ebbing and flowing of the tides. Yet our critic innocently ignores this mighty mechanical agency by substituting for it the strength of a cricket! We would not be surprised should the *Standard*, under the management of its Office editor, soon announce a new theory of the tides, and undertake to prove that they are caused by a pair of "sick locusts" pulling at the ocean, instead of the mutual attraction of the earth and moon! Why not, since he has no use for *gravity*?

other? This is a fair specimen of the little game Mr. Hall is playing before the eyes of the unsophisticated. *This ends the drum-skin objection.* Our philosopher ought here-after, in all consistency, to confine his figuring to "a very limited shell"—that is, of the drum-skins near the locust!

But referring to the slow motion of the tuning-fork, it is asked: How can such motion condense the air and send off waves at a velocity of 1,120 feet in a second? Suppose a fine coiled spring wire, weighing say a ton, was fastened to a hook a mile high, the lower end hanging to the ground, a very slow and a very weak pull at the lower end would cause every coil of that wire from bottom to top to move in less than a second of time. Uncounted tons of spring wire could be shaken from end to end with the slightest jerk. Neither the *weight* of the wire, nor the difficulty of rapid displacement, nor inertia, could hinder it. The air is one of the most elastic and easily compressed and rarified of the elements. It has been found by actual experiment that the sounding of a note by the human voice will make light, fine sand dance up and down and roll off the upper surface of a piece of paper properly stretched over the mouth of a cup, or glass, at a distance of eighty feet from the singer. This shows how easily the air is made to vibrate, and how our cartrains must yield in such a case. Is it not about time our Substantal philosophers were seeing these things? As it is not enough? The *air* does not travel fast when it carries a sound at the rate of 1,120 feet in a second, just as no part of a mile of coiled wire travels fast though a vibration goes its whole length in a moment. Bro. Munnell did not see this when, misled by others, he said in his first article, that the prongs of a tuning-fork must travel at the rate of 1,120 feet in a second in order to send off sound-waves at that rate. When a man with a crowd strikes the middle of an iron bridge, a mile long, and it vibrates to either end before he can count three, does the crowdbar or any part of the bridge travel as fast as the tremor? What philosophers these Substantalists are. But we are asked to believe that "the argument deduced from the analogy of the other senses, such as smell, for example, which can only receive its impressions from the substantial contact for a momentary period," is an argument against the sensation of sound being produced by the substantial contact of particles of air. Indeed! Are not odors and air both *substantial* and *material*, confessedly so? And is there not *contact* in the action of both on nose and ear respectively? Is not the analogy complete? No, says the Substantalist, to be analogous, the nose must come in contact with a *material* substance, like odor, and the ear must be touched with an *immaterial* substance called sound! This is a new sort of analogy, not to be found in the books, but *invented* to meet the new emergencies" which "this discussion has evolved." In all that we have said there has been no advocacy of any theory of sound. All we have aimed to do has been to set aside as the interest of the wave-theory. This has been done. His sophistry some of Wilford Hall's chief objections objections touching *weight* and *vibration* and *inertia* and *analogy* and *imaginary drum-skins*, have been not only set aside, but in the article we have been considering the author has virtually given them all up without seeming to know it. We did not look for such a complete and speedy relinquishment of objections that have been so long and so persistently held up as being insuperable.

in a precisely similar case, only on a smaller scale?

Weaker still is the next great illustration of a "giant pair of balances," with a million tons of quicksilver suspended at each end of its beam. Because the two million tons of metal would move by a locust lighting on one end of the beam, the critic again innocently supposes that the insect *moves* these two mighty masses of metal! We could have looked for such shallow reasoning from some of the earlier assailants of Substantialism four or five years ago, when the question was entirely new; but we confess our astonishment upon seeing it in the *Standard* at this late day. Can our critic not see that the locust only presses down the exact amount of its weight on one end of the beam, and thus lifts the same amount precisely on the other end, and that this is the extent of its work? Is it possible that he cannot grasp the simple mechanical thought that two mighty giants are already pulling down, each with a million tons of force on the opposite ends of the beam, and that one of these giants, taking advantage of the trifling assistance rendered by the locust, overpowers the other giant, and thus moves both masses? Is this too deep for our critic? If so, let us open his eyes by a genuine but simple illustration: An *athlete* attempts to lift a 1000 pound weight, and succeeds all but *one pound*. But a little child, standing by, puts its hand under the weight and lifts just *one pound*, and up goes the mass. Our critic, looking on, exclaims, with a shout, that this prodigious little child had lifted 1,000 pounds! The crowd echo his shout of applause, as they, too, cannot comprehend that the little child, though the *remote* cause of the weight moving, only lifted *one single pound*, while the athlete, the chief cause, actually lifted the weight with that trifling assistance! But possibly our critic needs more light before the scales will drop from his eyes. Here it is: A thousand ton boulder is equipoised on the brow of a hill, so near falling, that only a lump of hard clay just outside of its centre of gravity, supports it. A locust flying beneath this rock for shelter from a rainstorm, shakes a drop of water from its wing, and so softens this clay that it is crushed by the preponderance of weight, and down goes the boulder, sweeping everything in its path and cutting down trees ten feet in diameter. (See Problem of Human Life, P. 348.) Our critic, at a safe distance, beholding the devastation, again exclaims: What a mighty insect, thus to sweep down forest trees as if they were infinitesimal straws! But possibly by this time he has awakened to the fact that the locust did not do it at all, though it was the remote cause of its being done, and that the direct or efficient cause, with the boulder as its instrument, was the same mighty mechanical energy which displaced the entire ocean, and which moved the "giant pair of balances!" Is such fine distinction between the *remote* and *efficient* causes of mechanical events still too much for our critic? Then here is aid:—A mosquito buzzes in Jumbo's ear, makes the brute mad, and causes him to break his chain and tear down his building. Our critic exclaims for the third time—Behold what a mighty thing is a mosquito! to break chains and tear down buildings! We do not like to strike an assailant more than three such blows after he is down and at our mercy, but it is his own fault, as he began it for "his own amusement." Wonder how he likes the *fun* as far as he's got! He vaingloriously asserts that these weak illustrations constitute the "cannon," that "hits Sub-

stantialism full in the face!" What a pity that some critic cannot be found who can hit Substantialism a blow it can feel, and thus call out its real powers of rejoinder! But as there are no such critics in the market, we are forced to attend to the best that can be found.

His next most plausible argument and illustration are introduced in his attempted reply to our exposure of his shot-gun escapade, so thoroughly turned against him in the previous response. All through this attempted reply, self-conscience, weakness, and even failure is shown more emphatic than *italics* could have made it. The entire effort fairly reels with helpless confusion of ideas and riotous assertions. He even (intentionally or unintentionally) mis-states our positions and misrepresents our arguments, and to cover his shot-gun disaster, does not venture a logical analysis of a single point we made. Does this seem severe? Then here is the proof. For example; we took his "shot-gun," firing one charge with a given mechanical force, and so improved it, that it would send out 440 such charges in a second, the same as our locust. Now what does he do, but deliberately convert this improvement into 440 "guns," or one gun for each bullet fired! We then still further improve it on the principle of the *wave-theory locust* to fire a similar stream of projectiles in ten thousand different directions at the same time, in order to let the bottom drop entirely out of his drumskin-difficulty, which it most effectually did. Our critic seeing this, and being fully conscious that no reply was possible, what does he do, but try to mislead the reader by converting our destructive *Gatling* into "*ten thousand guns*!" He knew that to leave it *one single gun*, firing streams of 440 projectiles in each second, and in *ten thousand* different directions, like the *one single wave-theory locust*, must kill his drumskin-difficulty, since the mechanical force of such a gun must be estimated by the number of projectiles sent out with a given force, whether their range should be obstructed or not. Hence, his only hope of escape was to change our annihilating weapon into "*ten thousand guns*." But we will not allow this mode of escape, desperate as are his necessities. No wonder that in such confusion, he should mutter—"very amusing—very!" That is exactly what Tyndall muttered, when he first saw the "Problem." The truth is, the critic thought he could create more "smoke" to begof his readers with "ten thousand guns," than with one. But his smoke is too thin to interfere with the handler of our *Gatling*. Here is the way he trains it and plays it upon the retreating enemy:

For example, the critic insists (as if repetition would make a fallacy true) that if the gun fires one bullet with a force exerted upon the air, sufficient to penetrate *one shingle*, then according to our drumskin argument, if "twenty thousand shingles" were placed on end in line, *the single bullet ought to penetrate the entire "six hundred feet of solid timber."* Why? Because the bullet exerts *one shingle penetrating power on the air at all parts of its range!* We thus state his criticism in all its force, and here is our reply: Though the bullet exerts that much penetrating force on the air at each point of its travel, it can only exert this force at one point of the air at a time, its force ceasing at any point, the instant it reaches the next, and so on during its entire travel. Should it at any point encounter a *shingle* it penetrates it, thus giving up its force and coming to rest. Where, then, are his six hundred feet of *solid timber*? Gone into "smoke," to keep company with his "giant pair of balances!" But

with our improvement upon his gun, making it send a stream of projectiles in close succession, like the aerial projectiles from the locust (if the wave-theory be true), the case is entirely different. As each bullet has the same one-shingle penetrating force that the single bullet had, we have only to multiply this force by the number of points of air occupied by projectiles flying at one instant of time, and we determine, of course, the mechanical power of the gun, making the result exactly as we gave it in our previous response, which the reader will please refer to. To prove this, suppose twenty thousand bullets were thus flying from the gun in succession, passing through the air at one time, like twenty thousand supposed air-pulses from our locust. Then suppose "twenty thousand shingles" should be instantly interposed—one in front of each bullet—it is perfectly plain that every shingle, or "*six hundred feet of solid timber*" would be pierced; though it is equally plain if all these shingles had been in position at the start, that the entire energy of the gun would expend itself on the first few shingles in the row. Again, we are constrained to ask, could any one but a novice in science suppose that the gun exerts any less mechanical force on account of its range being thus obstructed and curtailed?

Marvelous, that we have to waste words to explain this to any intelligent scientific man! His unfortunate illustration of a stone thrown 100 feet, with force to break a pane of glass weighing 100 pounds at any point in its travel, is of precisely the same fallacious character and is answered in the same way. Should we throw a single stone, it is self-evident that a single pane of glass, interposed at any point of the stone's travel would be broken, bringing the stone to rest. But convert us into a human *wave-theory mitrailleuse*, capable of sending a stream of such projectiles close together at the rate of 440 per second, like a wave-theory locust, and if the stream extended far enough so that "12,000" panes of glass could be instantly interposed, one in front of each stone, it is plain that the whole "1,200,000" pounds of glass would be broken; and if the critic's head were in the place of the last pane of glass, he would be apt to *see stars*, as about the most likely way to give him light. He says, he introduced this stone and glass illustration "for the sake of transparency." It turns out like his shot gun, and "giant pair of balances," to be a *transparent sophistry*. He confesses that the two are alike, for after stating the stone-throwing illustration, he adds, "Our shot-gun illustration was *exactly similar!*" True, O critic! It was "exactly" such an unmitigated absurdity, as we have just pointed out.

Now here is a proposition: If our critic really desires the truth, will he leave all side issues and loose rattling assertions, and meet us squarely on this drumskin phase of the locust problem, including the shot-gun and stone-throwing illustrations? Dare he come right down to the *analysis* of this one single question, instead of scattering over a wide field, touching upon many points, but finishing nothing? This would give us both ample space and opportunity for critical *analysis*, the very thing Substantialism courts. Does he court it, or does he prefer to scatter? We shall see.

A few more of his superficial difficulties must be noticed and brushed aside before we can, in justice to the reader, close this response. True enough, a lady can vibrate her vocal organs easily 440 or more times in a second, *while she cannot move her hand back and forth ten times in a second*, using all her strength. Why?

Simply because one is a musical instrument with a *tensional property* and *vibrational number* naturally permitting such rapid oscillation like a tuning-fork, string, or bell; while her hand has not that property, and can only receive a bodily movement by the application of mechanical force, at a rate of oscillation exactly *proportioned to mass! Hence the larger the mass the less number of to-and-fro movements in a second is possible with a given force, owing to the resistance of inertia*. Does he see the "point" now? This law, properly carried out, will solve every difficulty our critic has so flippantly paraded on rapidity of vibration. Plainly, while the lady might move back and forth a freely suspended *pound of metal* eight times in a second, she could not move 100 pounds more than three times in a second; or 1,000 pounds more than once in a second, or 1,000,000 pounds more than once in thirty seconds, or 20,000,000 tons more than once, say, in ten hours. What infantile innocence, then, to talk of an insect, with a million times less strength than a human being, moving 20,000,000 tons of air, water, or quicksilver back and forth 440 times in a second. Is not this "point" plain enough to be seen? *Air* is not a musical instrument and has no *tensional property* unless confined. If the locust moves 20,000,000 tons of it the mass must move bodily like so much suspended quicksilver as our critic admits, the two being alike in that respect.

The *sand* dancing on a *stretched membrane* eighty feet away, by a tone of the voice, is not done by shaking the air at all. It results alone from the substantial sound-pulse striking a membrane in unison with its vibrational number, the tone thus exciting it into tremors by *sonorous sympathy*, as a magnet emits pulses of immaterial substance to excite sympathetically and move a piece of iron! This has been repeatedly explained in the "*Problem of Human Life*," and *Microcosm*.

The suspended wire spring extending a mile high, to which the critic refers, as being easily moved by a slow motion at one end given to it longitudinally, has not the slightest similarity to the effect of a slowly-moving prong acting on the unconfined air. Is it possible that the critic can not see the difference? If he moves his hand at a velocity of *one foot in a second* through the unconfined air, it is perfectly plain that no compression of the air takes place, and no pulse is sent off. The air-particles in front, by their property of mobility, simply circle around his hand, taking their place behind it to equalize disturbance. *Can the coiled wire spring do anything like this?* What superficiality! Yet a tuning-fork sounds audibly, as Capt. Carter's experiment shows, when its velocity of travel through this unconfined and perfectly mobile air is 200,000,000 times slower than the motion of the hand *at one foot in a second!* Will our critic try to imagine how such almost inconceivably slow motion could compress the mobile air and send off waves?

Of course a crowbar struck heavily on a bridge would jar it, especially if the bridge were *tensioned*, as it usually is; but such blow would crush the life out of a million locusts, while it would take a million such bridges to weigh as much as the mass the single insect is supposed to displace 440 times per second, and that, too, *without any vibrational tension to aid it!* Thus, one by one, the critic's points, under rational analysis, fade away and dissipate like the evanescent shadows of half-forgotten dreams. No point, we boldly assert, that can be raised against Substantialism can stand for one moment under careful scientific criticism.

REMARKS BY THE MICROCOSM ON THE FOREGOING.

Full and unanswerable as is the foregoing Response to the *Standard*, it unavoidably left two or three important points in the criticism untouched in the effort not unduly to extend the reply. Thinking that these ingenious fallacies, if not answered, might mislead some to suppose they contained force, we will now briefly set them aside. One is a current sophistry, and is introduced in his very first sentence, where he asserts that "*the wave theory teaches that sound is a sensation made upon the organs of hearing*," etc. Prof. Tyndall, the highest authority in the English language, on the wave-theory flatly contradicts the critic. He distinctly says:—

"Thus is sound conveyed from particle to particle through the air. The particles which fill the cavity of the ear are finally driven against the tympanic membrane, which is stretched across the passage leading to the brain. This membrane which closes the drum of the ear, is thrown into vibration," etc. "Thus also we send sound through the air and shake the drum of the distant ear." Tyndall on Sound, pp. 4, 5.

Sound is thus the very thing which passes through the air from the distant sounding instrument; and this thing which travels (not the mental impression, of course), is "*sound*" to all intents and purposes before it reaches the ear, as much as fragrance is *odor* before it reaches the nose, or as much as a luminous ray is *light* before it reaches the eye! The critic is thus flatly proved to be wrong at the very start, and therefore it is hardly probable that he could be any nearer right in other portions of his pretentious criticisms. The sensation produced upon the brain, it is true, is sometimes metaphorically spoken of as *sound* by a well-known trope called metonymy of speech, in which the effect is put for the cause. The critic was no doubt excusable for having been led into such an error in his great anxiety to avoid the Substantial Philosophy which teaches that sound, like odor and light, is a real substance which exists as much in the outside air as after it reaches the tympanic membrane. He adroitly supposed if he could prove sound to be all in his ear, as mere sensation, that it would cripple Substantialism. He was not sharp enough to see that we could prove light to be all in his eye, and odor to be all in his nose, and heat to be all in his cuticle, by the very same logic.

Then he runs loosely into another vagary by supposing that air particles hitting the ear are entirely *analogous* to odorous particles hitting the nose; and he scouts the idea of any analogy between odor, a material substance, and sound as a substantial emanation, since we hold sound to be *immaterial* substance! This shows what crude ideas he has of the meaning of the term "*analogy*." Really, does the critic not believe in the existence of *immaterial* substances in nature? If not why does he not say so frankly, and thus let it be known that he regards his own life, soul, mind, or spirit as a nonentity without any analogy in the universe; and that the future existence he hopes for is an insubstantial mode of motion, as his flippant flings at Substantialism would imply? He thinks that because the air-particles hit his drumskin, according to the wave-theory, it is the same as for the odorous particles, emitted from the distant flower-garden, to lit his nasal organs, and hence a true analogy. This seems to be about a fair specimen of his *analogical* methods of thought. But where

is the analogy between the two? Do the air-particles travel from the distant locust a mile away to strike the drumskin of the ear, as the odorous particles actually travel from the flower-garden to strike the nasal membrane? He must believe it if there is any such analogy as he describes, and consequently a locust, by thus emitting the air-particles would start a veritable tornado more destructive than was ever heard of, causing the whole atmosphere permeated by the sound to travel at the rate of a mile in five seconds! If he does not teach this then his idea of analogy breaks down, and if he does, it blows his logic to destruction. But he will say No; I hold that the ear-drum is acted upon by material air-waves, and hence the analogy with material particles of odor. But where are your odorous *waves* sent off from the distant *rose*, to bend the nasal membrane "once in and once out" as each of such waves of fragrance strikes it, thus producing the sensation of *smell* as simply a *mode of motion*, just as in the case of *hearing*? Thus again all analogy breaks down according to the *Standard* critic, as well as according to the wave-theory of sound. But Substantialism, on the other hand, beautifully maintains the perfect analogy existing between all the senses, from the lowest—*tactility*—to the highest—*sight*; and that all sensation, according to the harmonious system of Nature's laws and processes, is caused by the actual contact of the sensation-producing substance itself. Hence it in no wise lessens the *analogy*, according to the true meaning and use of that term, because these various substances of contact increase in a regular ascending scale of refinement, as the crude conceptions of the critic led him to infer. He actually supposed, because sound corpuscles were vastly more sublimed and tenuous than odorous corpuscles, that all analogy between them was destroyed! Why, then, did he insist that there was complete analogy between material *air* particles and *odor* particles, when the difference in refinement between the two is almost inconceivable? "Out of thine own mouth will I judge thee." It is to be hoped that this precipitate critic, with all his present gross conceptions of the *analogies* of true science, will yet grow into the beauties of Substantialism, which so completely harmonize the apparent discrepancies that exist in Nature. And in conclusion we refer the reader to the critic's last paragraph, and what he says about "the merest sophistry" of "Wilford Hall's chief objections to the wave-theory," in the light of what has been here said in reply, and as a specimen of about the cheekiest string of bald assertions anywhere to be met with as a part of a scientific discussion.

A RATTLING CONTROVERSY.

For several months past there has been going on in a Kansas paper, a critical controversy between one of our subscribers, Dr. L. Northrup, of Valley Falls, Kansas, and David Eccles, of Kansas city, Mo., on the merits of Substantialism, and particularly on the subject of the new departure in acoustics. Eccles is a virulent materialist, an opposer of, and scoffer at all religion, and without any apparent respect for the sentiments of his fellow men. He has made it a special point since the *Problem of Human Life* was published, to ridicule its teachings in the most vituperative manner, and to spare no opportunity to disparage its author in the *Kansas City Press*. We have paid no attention to his diatribes and personal attacks, but we cannot but be interested in the fact

that he has now met his match in Dr. Northrup, the last letter from whose pen we give below:

NORTHROP vs. ECCLES.

If bitter invective and absurd statements without proof were arguments, then no man in America could stand before David Eccles. Every pretended scientific statement he makes with reference to the theory, generation, or nature of sound, can be upset without the least difficulty. What he says about the discoveries of Copernicus and Galileo being kept down by the bigoted religious influences of that day, comes with a poor grace from an infidel, who is using a thousand times more contemptible means to keep down the discoveries of Wilford Hall, which are equally important with those of Copernicus and Galileo, and which already stand on as firm a foundation of scientific truth. Eccles foolishly thinks that his vituperative flings can stop their speed. He is mistaken, as he will see by reference to the columns of THE MICROCOSM, announcing presidents, professors, and principals of colleges by the dozen, coming over to the Substantial Theory, and rejecting the wave-theory, refusing any longer to teach it to their classes. No religious bigotry of Christendom or heathendom was ever so reckless or unscrupulous as the materialistic bigotry exhibited by Eccles in his blind opposition to the Substantial Philosophy of Wilford Hall. But it is no use. He himself will be the greatest sufferer in thus inconsiderately kicking against the pricks. What he says about the Substantial Theory of sound being held and taught before Newton's time, is simply not true, and we challenge him to the proof. Let him quote one single authority, giving page, or else stand convicted of a deliberate falsification of history to serve a malicious purpose.

Now a few words in answer to his ridiculous attempt to meet the "finishing demonstration" of Wilford Hall on the exceeding slow travel of the prong of a tuning-fork. That barbed arrow from Capt. Carter's bow, more than confirming Dr. Hall's demonstration, struck painfully in a very vital part, as is manifest by the convulsive spasms it threw the victim into. He fairly shivers with incoherent nonsense, trying in a frenzy of desperation to make the number of vibrations in a second equivalent to swift travel. No one, at all familiar with Wilford Hall's repeated exposure of this soft quibble, but will look upon the confused embarrassment of this reckless opposer with pitying contempt. Here is what Prof. Tyndall confesses plainly and unequivocally. "Imagine one of the prongs of the vibrating fork swiftly advancing, [not rapidly vibrating.] It compresses the air immediately in front of it, and when it retreats it leaves a partial vacuum behind, the process being repeated at every subsequent advance and retreat. The whole function of the tuning-fork is to carve the air into these condensations and rarefactions." *Lectures on Sound*, page 62. How childish to say that the condensing of air by which to make a sound-wave has anything whatever to do with the great number of stops and starts a prong makes. It is the "swiftly advancing" in a single forward motion which Prof. Tyndall says does the condensing of one wave and its single travel "when it retreats," which leaves a partial "vacuum," making a "rarefaction?" Hence Prof. Tyndall, mistaking appearances, really supposed that each individual forward motion must be swift, and the great number of starts and stops to which Eccles resorts, never entered his head! Tyndall never awoke from his delusion about this supposed

"swiftly advancing" until he saw the "*Problem*," when in a bewilderment of astonishment like a conceited pugilist, "knocked out" by Sullivan with one blow straight from the left shoulder, he forced a smile and exclaimed "how funny!" Yes, that "swiftly advancing prong," and his tin tube experiment for blowing out a candle by a "sound pulse" and without air, have rendered the whole thing so "funny" (from the left shoulder of Dr. Hall), that he has not since dared to come to the scratch for another blow.

But Eccles brags that he has plenty of time or he would not notice Hall. What he lacks in scientific sense he makes up in leisure and verbal bosh. Take his illustration—three hundred vibrations in a second. Suppose them to be a tenth of one inch, swinging each way, making the whole distance the prong travels in a second sixty inches, or counting the middle of each swing twice as swift as its average (it is exactly one-third swifter, as Prof. Mayer admits, page 32 in his late work on sound), we call its swiftest action on the air 120 inches, or a velocity of just 10 feet in a second. Now it is plain that if one of the travels of the prong at that velocity would not condense the air and drive off a pulse or wave 1120 feet a second, 600 of them would not do it, each swing moving only at the same velocity. Reducing it then to an amplitude of the twentieth of an inch swing, and retain, of course, 300 vibrations. It is plain that the velocity of swiftest travel is now but five feet in a second, with only one half as much condensing power on the air. Then reduce the amplitude of swing to one two-hundredth of an inch, still keeping the same 300 vibrations in a second. The swiftest travel of the prong, at any part of the swing, is only at a velocity of six inches in a second. Yet Prof. Tyndall supposed this to be "swiftly advancing" till Wilford Hall woke him up; and Eccles now takes warning and thinks to shift the condensing operation of the prong in its "swift" travel through the air, as Tyndall superficially supposed, to the great number of stops and starts, without the slightest reference to whether the prong travels as swift as a bullet or as slow as a snail. Does Eccles really suppose his readers all idiots to swallow down such shallow evasions? But the worst part of the argument is the culmination as given in Capt. Carter's experiments, confirming Dr. Hall's demonstration, that the prong still sounds while traveling a distance of only the one 64,000,000th of one inch at a movement, and consequently at its swiftest aggregate motion only at a velocity of one inch in two years; yet because it makes 256 of these infinitesimal vibrations in a second, Eccles cannot comprehend that its rate of travel is slow—25,000 times slower than the hour-hand of a clock. Yes, Tyndall, the highest authority on sound in the English language, really thought that the prong thus traveling through one of its swings, was swiftly advancing—swift enough to condense the air! This will fill the space allotted. In my next I will answer his five questions on elasticity, so he will want even more leisure than he now has to make even a ghost of a reply. In the meantime those wishing to see this elasticity problem thoroughly discussed should read the numbers of the MICROCOSM as they are now coming out.

L. NORTHROP.

☞ Let each subscriber who is interested in the success of this Magazine, read carefully the different suggestions farther on toward the close of this number, such as—"A Webster Dictionary Free," "Our Life-Subscriptions—closing chance," "Renewals for Volume 4," etc., etc.

WILFORD'S MICROCOSM.

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SPECIAL NOTICE.

In our conduct of this journal we desire to give our list of excellent contributors the widest possible latitude for the conveyance of their honest convictions, so long, at least as this liberty does not conflict with the general aim and scope of THE MICROCOSM. But we wish our readers definitely to understand that we do not hold ourselves responsible for the views of our contributors, nor, in fact, even for our own views, as we are liable at any time to change ground on receiving more light, as we have done more than once since this paper was commenced. But, generally, we hope and aim to be consistent.

EDITOR.

EVOLUTION-EMBRYOLOGY.

The argument which evolutionists now acknowledge to be the strongest in favor of the development theory, and which they insist upon as unanswerable, is based upon that branch of physiological science called *embryology*. It is now claimed by advocates of the evolution of man's body from lower animal forms by transmutation, and of one species of animals from another, from the highest to the lowest, that all vertebrate animals during embryonic development pass through exactly the same transitional form and outline of structure, as indicated by such pedigree; that in fact the infant, the puppy, the chicken, the tortoise, and the fish are exactly alike during the early stages of embryonic development; that all of them have *gills*, the same as the fish from which they all descended; and that all of them have tails, including the human embryo, the same as the puppy, tortoise, etc. The argument based on these facts is that all vertebrates must have originally descended from the fish, and that nature thus makes a record of the fact by causing all embryos, during the brief period of early gestation, to pass through the long line of ancestral forms; thus, as Haeckel expresses it, repeating the phylogenetic or tribal history of the whole vertebrate class, in the ontogenetic or pre-natal development and growth of each individual.

This argument was strongly presented in Darwin's *Origin of Species*; but it remained for the versatile, Prof. Haeckel, of the University of Jena, to carry it out to its greatest and minutest extent in his two elaborate works, the *History of Creation* and the *Evolution of Man*. What he has not said on this question of embryology in defense of the development theory need never be attempted to be said, for he has in his zeal for Darwinism gone far beyond his teacher, as well as far beyond reason and truth.

We examined this whole question exhaustively in the seventh chapter of the *Problem of Human Life*, and endeavored to show wherein both Darwin and Haeckel were mistaken by following the lead of a few careless anatomical and physiological writers, and influenced as they were, in addition, by their own prepossessions. Had they been entirely free from bias, through the influence of their preconceived views of the necessity of development as accounting for the origin of species, they could easily have seen that the "little human tail," so visible in the early embryo of the infant, was but a natural view of the outlined spinal column, which forms first in its anatomy, and before the lower limbs, hips, pelvis, etc., are sufficiently developed to cover, and thus neutralize, its unduly extended appearance as a "tail." Evolutionists, eager to sustain their doctrine, short-sightedly supposed that this lengthy projection of the spinal column, having the appearance of a "tail" in the embryonic infant, chicken, tailless ape, etc., gradually aborts or becomes shorter and shorter as the embryo develops; whereas it is a demonstrated fact that it remains of precisely the same proportionate length from the start, and its appearance of aborting or becoming shorter is entirely due to the fact that the lower limbs, hipbones, pelvis and fleshy portions, developing later than the spinal column thus fill out the embryonic body toward the end of the column, and in this way in effect shorten this "little human tail." Thus these evolution scientists, like many other superficial men, have supposed that the shore was coming to the ship when it was only the ship approaching the shore. One has but to

examine with care the numerous plates in Haeckel's two large works named, and carefully note the different stages of development as represented even in his own exaggerated drawings (which we may be sure do all that is possible to favor the "little tail" hypothesis), and he will see that if due allowance be made for the after-development of hips, pelvis, etc., the tail-argument of the evolutionist vanishes into thin absurdity.

So also with the "fish-gills" supposed to be printed ontogenetically on the sides of the necks of all vertebrate embryos in their early stages of development. We have denied most positively in the *Problem* that any such "gills" occur, even taking the same exaggerated and favorably disposed plates as our guide. The so-called "gills" are nothing but an open space across the throats of the various embryos, owing to the bent position of the head forward upon the breast in the economy of Nature during gestation. As the head begins to lift itself from this bent position, it leaves for a time a space in the front portion of the neck not filled in with flesh, which to these "little-tail" scientists can be easily exaggerated into "gills." But the truth is, these slits, when impartially examined, have no resemblance to the gills of a fish or to anything save the simple openings across the throat, caused as we have described them.

As conclusive proof that the "gill" hypothesis, the very strongest argument in favor of evolution, is a forced and far-fetched supposition, framed to serve the cause of descent from lower animals, it is a fact that Prof. Haeckel himself absolutely destroys the force of his argument by unwittingly including the fish itself with his embryonic plates as among these phylogenetic descendants! A more suicidal attempt to force upon the public credulity a false theory of science was never perpetrated by an author. Look at his plates and behold the gross fiasco! Here, in the earliest stages, are placed in juxtaposition the embryonic infant, the puppy, the chicken, the tortoise, and the fish; all exactly alike, with their long "tails" and the same openings in the throat, which he calls "gills." But mark! these "gills" of the fish, are not on the sides of its neck where they immediately appear in the next stages of development, as shown in the ingeniously engraved plates! Now why did not Prof. Haeckel, or his artless artist under his instructions, give us the transitional stages of these embryonic openings in the throat of the fish as they changed from these throat-openings into real gill-openings in an entirely different part of the fish's neck, and some considerable distance from those throat-openings which are so learnedly paraded as the real gill-arches of the fish as well as of all other vertebrate embryos? Surely, if these throat-marks are actual gills in the infant and puppy, they should be actual gills also in the fish. Why, then, are they in the wrong place on the fish's neck, and why do they, by a single leap, go to the side of the fish's neck right where gills naturally belong, without the least sign of traveling by slow stages of transition, as Darwin tells us all evolutionary processes proceed? The truth is, Prof. Haeckel did not dare to give these transitional stages, simply because he knew that no such transitions of these throat-marks take place. He evidently knew that they are not *gills* at all in any sense, and that the true gills of the fish, developing in due course of time in the proper location on the neck of that embryo, proves it. We have challenged Prof. Haeckel, or any other evolutionist, in the *Problem of Human Life*, to show this transition of the throat-marks and their development into the real gills of the fish, or any-

thing resembling such transition, if it really takes place. If these slits in the front throat do not turn into the real gills of the fish, then it totally explodes the "gill"-argument of evolutionists, and proves that the so-called "gills" in the human embryo are something having no phylogenetic signification whatever. Will Prof. Haeckel, or any other evolutionist, accept our challenge, and show the transition required and absolutely essential to give any cogency to this greatest argument for the theory of the transmutation of species? Fish, as now hatched artificially, can be examined under the microscope at all stages of their progress in developmental growth, from the first embryonic form, hourly if necessary, till they emerge from the eggs. As Dr. McCosh, President of Princeton College, in his recent work on *Development*, pronounces the embryonic argument as among the chief reasons for accepting the development theory, meaning thereby *transmutation*, perhaps he could not do a better work for the cause of science in his declining years, than to put his professor of natural history to work on this very problem of sketching the progressive stages in the development of the embryonic fish, and thus supplying the unfortunate deficiency, so ingeniously perpetrated in the plates of Prof. Haeckel's great works. If Dr. McCosh will do this and then write another treatise on "Development," upsetting this "gill" superstition and that of the "little human tail," and thus explode evolution by taking away from it embryology, its chief support, he will do a service to science and to the Christian world, that will almost infinitely surpass the benefit of the other works he has written; and in this way, he will partly atone for the mischief he has wrought. Let him try it and thus leave a real monument to his memory that will live.

But the most absurd feature of this "gill" argument is this: Why does Prof. Haeckel take pains to give an engraving of the embryonic fish with those bogus gills across the throat, to prove its phylogenetic descent from *itself*? Here is the funny part of this embryonic proof. The embryo fish has the same throat marks that the infant, puppy, chicken, and tortoise have; but in addition, it has real gills on another part of its neck! No one doubts that the fish descends from the fish, and that it would naturally, inherit gills by the laws of development and growth, and thus show them in its early embryonic condition. But the fact that it does show *gills*, and also shows these common throat-marks besides, is proof strong as holy writ, that the throat-marks are no phylogenetic or tribal indication of gills or of piscatorial descent, since the fish has real gills showing real descent, as well as these marks in common with all other embryonic vertebrates. Clearly Prof. Haeckel and all evolutionists have over shot their mark by loading their phylogenetic gun too heavily. They should have left out the fish and stopped short with the tortoise! To put in a tribe of vertebrates that naturally possess gills and thus try to prove their descent from themselves by showing real embryonic gills, thus proving the claimed "gills" of the human embryo to be no gills at all, is about the most self-stultifying piece of scientific finessing we have ever known a shrewd investigator to perpetrate. Yet this bungling work, of unwittingly engraving the fish along side of the infant, has succeeded in catching such fish as Rev. Joseph Cook and Rev. Dr. McCosh, till they have really been induced to resign themselves quietly to the evolution net, with its theistic accompaniment that it was God's

plan, and to confess that we once breathed through "gills," or that we were once really nothing but fish, and that we still breath through "gills" in our early embryonic condition. We fastened this humiliating surrender to Darwinism upon Joseph Cook in our Introduction to the *Problem of Human Life*, but we are glad to learn that the eminent Boston lecturer has become ashamed of it and now says he did not mean that we ever breathed through "gills," though he distinctly gave it in one of his lectures as a scientific "fact." Perhaps the following correspondence of Prof. Cheeks, of Washington City, with Mr. Cook, and the Professor's letter to THE MICROCOSM, would not be uninteresting to the reader at this stage of our argument:—

WASHINGTON, D. C.

A. Wilford Hall. Ph. D.

DEAR SIR :—I promised in one of my first letters to you that I would, as early as possible, write to Joseph Cook and ask him to explain his physiological proposition that "we once breathed by a membrane, then by gills, then by lungs." (Biology p. 236.) My opportunity came a few days since, as he was to lecture in our city. So I wrote him asking how he could make the above "physiological fact!" harmonize with the settled opinion on this matter by all well-informed physiologists, *i. e.*, that an infant does not "breathe" at all until its birth, and that, during gestation, it depends entirely for nutrition upon the substance of the ovule, and the umbilical circulation of the mother. I then presented the difficulty, as so ably set forth by yourself in the *Problem*, *i. e.*, "As these 'gills' entirely disappear, according to all authorities, including Ernst Haeckel, at the eighth week of gestation, how does the embryo manage to put in the interim of twenty-six weeks till its birth without breathing at all?" I assured him that it was the belief of many who had read Prof Haeckel's work, that he merely regarded these "gill-arches" as the "ontogenetic record of man's phylogenetic or tribal descent from some fish-like ancestor." To all of which Mr. Cook responded on January, 17th inst., as follows:—

"Sir: In Washington I was too mercilessly hurried to reply to your note. Understood as I meant them, the words that I cite would give you no trouble. You put on them an interpretation I never dreamed of. I think your position on the point in question is not different from mine.

Yours truly, JOSEPH COOK."

This is satisfactory in one sense, in that he confesses that his position on this question is the same as mine; but unsatisfactory in that it either proves me to have been woefully obtuse, in misunderstanding the import of the plainness of propositions, or else deficient in knowledge of the use of the English language. It is true Mr. Cook was quoting Draper's Physiology, p. 550, but further on he uses it as an argument of his own in support of Identity. He says in his Biology, p. 208. . . . "You *breathed by gills* once; you *breathe by lungs* now. Is your identity affected in the change?" I understand this question to assume the fact that I once *breathed by gills*, either in the prival or in my own embryonic condition, but that in the process of evolution, these "gills" have been superseded by lungs, and that I now breathe by the latter instead of the former. Why? because lungs have taken the place formerly occupied by gills. However, I have this somewhat pleasing reflection with which to comfort myself that I was not alone in my belief or in my interpretation of his language.

Respectfully,

P. C. CHEEKS.

As a full explanation of the foregoing correspondence, it might be necessary that we quote a few paragraphs from the *Problem* itself in reference to Joseph Cook's views, as referred to by Prof. Cheeks. Especially might this be interesting to those who have not seen the book. The following paragraphs embrace the part referred to by Prof. Cheeks:

Let us now take the testimony of this eminent lecturer and writer (Joseph Cook).

"I have not criticised, *I have even defended, the theistic doctrine of evolution.* I have endeavored only to show that the *atheistic and agnostic forms of that doctrine are violently unscientific.*"

"The position of this lectureship is that there is a use and abuse of the theory of evolution. I hold a theory of evolution, but not the theory. What do I mean by the theory of evolution? Precisely what Huxley means when he says, in so many words, that *if the theory of evolution is true the living must have arisen from the not-living.*" —Lectures on Biology, pp. 111, 184.

This is plain and to the point. Joseph Cook thus accepts the evolution of the different animal species, on the condition that God controls the laws of development; but he rejects it only when it involves spontaneous generation, or the idea of evolving the "living from the not-living," as taught by Profs. Huxley and Haeckel.

In keeping with this outspoken acceptance of evolution, Joseph Cook says:

"The question of *chief interest to religious science* is, whether the new philosophy [evolution] is to be established in its *atheistic*, its *agnostic* or its *theistic* form." Lectures on Biology, p. 10.

I take issue with this eminent authority, and deny his conclusion most emphatically. On the contrary, I assert that "the question of *chief interest to religious science* is whether the new philosophy is to be established "at all, or in any "form." What the Christian world wants to know, and what investigators of *religious science* need to inquire into, is, not which "form" of evolution is to be accepted, but whether there is any necessity for accepting any of its forms,—or anything in the shape of evolution, either atheistic, agnostic, or theistic. This highly esteemed lecturer seems to have taken it for granted that evolution is a foregone conclusion, in some form, and his "chief interest" now is to determine which of the forms will come nearest leaving a modicum of the religion of the Bible—enough to *swear* by in a court of law, if not enough to *pray* by. I assert that Joseph Cook, Dr. McCosh, and the hundreds of eminent clergymen who agree with them, and have followed their lead, if they have not shown the "white feather," have at least shown undue haste in thus pulling down their colors, without even having fired a gun or been asked to surrender. If they were not able, as they evidently were not, to explain the scientific facts of Darwin, Haeckel, & Co., upon which they claim to have established the theory of evolution, why should they have been in such a hurry to throw down their arms at the first boom of evolution artillery and sight of smoke, and conclude that the facts were inexplicable by anybody else? They seem to have concluded, judging by their action, that what they did not know upon this subject, was not worth knowing, or at least must be past finding out; and that problems they were not able to solve, could never be solved by man. Hence, this surrender without a struggle. Such weakening in presence of these most virulent assailants of religion, whether under the disguise of this so-called theistic form of the "new philos-

ophy," or Prof. Haeckel's outspoken atheism, is unbecoming the grand mission of the most prominent exponents of religious science in this country.

But even after thus surrendering to evolution, with its theistic proviso, there is a manifest indication of shakiness, a want of confidence, and a feeling of insecurity in the minds of the eminent theologians named, or they would not blanch as they so evidently do, when they come to face the legitimate consequences of their "new philosophy," and yield the last point in the controversy with Darwinism,—the evolution of man's animal organism from that of some extinct form of ape. Why do they hesitate here with trepidation and doubt? Prof. Gray, though not outspoken, virtually gives up all, and consistently claims that Darwin's view of the extent of evolution is either all right or all wrong, and that man is necessarily included in the lineal descent from that simple form of life first created, whether it be a polyp or an ascidian. But Joseph Cook and Dr. McCosh, confused and trembling, hesitate to accept this final and legitimate act of the evolution drama; and that, too, without one scintilla of reason for so doing, after conceding evolution up to the orang-outang, save the fact, as Joseph Cook elaborately argues, that the average brain of man is more than twice that of the highest ape in cubical contents. Hence, here there must have been a special miraculous leap. But why do they not listen to the teachings of their scientific master, Darwin, who explains all this most beautifully by the defects in the geologic and palæontologic records! Why do they not reason about this evident leap in cranial and cerebral structure, from the highest known ape to man, as they are obliged to reason in explaining the leap from the reptile to the bird, from the fish to the reptile, from the tortoise to the mammal, which are leaps vastly greater in anatomical structure and resemblance than the one to which they demur? If they can, with such alacrity, accept the development of the almost human form of the Chimpanzee from the fish, and fill up the innumerable gaps in structure by imagining lost pages in the paleontologic record, why not be consistent and say with Huxley that the connecting fossil man-ape, which bridges the chasm between the small brain of the present anthropoid monkey and the immense brain of man, has not yet been found, but probably will be, just as the archeopteryx has but recently been discovered which closes up the hiatus between the reptile and the bird? And since they have now the convenient "theistic" panacea for all the other lame joints in the "new philosophy," by which to harmonize it with "religious science," why argue so earnestly for this one exception to the rule, and that man must have been made as the scriptures teach, by a direct miracle, just as if it would detract from the glory of God to have made man as He condescended to make the orang-outang, by gradual development? If it was God's method of making a monkey, why not of making a man? What is the use of having "theism" mixed up in it at all, if it will not help us out of the whole difficulty and account for the formation of man's body on the same principle employed in constructing the body of the gorilla or chimpanzee?

* * * * *

Theistic evolutionists, thus driven to the wall of consistency, are forced to admit, however hard they may struggle against it, that if *whales* were "created" by development from other animals, *man* must have been "created" by the same process. Although the Rev. Joseph Cook evi-

dently dreads the logical consequences of this conclusion,—the unavoidable outgrowth of the "new philosophy," whether theistic or atheistic in form,—yet he makes many statements in his lectures which unintentionally but plainly point to Darwin's unabridged views, that man, as well as the ape, the puppy and the tortoise, is the lineal descendant of the fish. Take this one:

"It is a *physiological fact* that every human being once *breathed* by a membrane, then by gills, then by lungs,"—Lectures on Biology, page 236.

This is a clearly expressed indorsement of Darwin's and Haeckel's embryological argument, that the embryonic infant, as well as puppy, chicken, tortoise, etc., at an early period of development, possesses the *gills* of the fish, which fact they triumphantly adduce as evidence that man, as well as the dog and other lower animals, descended by transmutation from some branchial ancestor,—a thing by the way totally fallacious and without even the foundation of one correctly understood scientific fact upon which to rest, as abundantly shown in the Seventh Chapter. But no matter for this. Joseph Cook does not even suspect that this "gill" argument of the evolutionist is a deliberate fraud upon physiological science and the intelligence of mankind; and as a consequence the great Boston lecturer innocently falls into the trap set for him by Haeckel and Darwin, and announces it as an important "physiological fact," thus admitting that embryonic infants have actual *gills*, which, if it be a fact, can only be explained, says Darwin, on the hypothesis that man descended from the fish. And if man descended from the fish, his blood relationship to the monkey can hardly be doubted.

But the most remarkable phase of this "physiological fact," so positively announced by Joseph Cook, is, that these "gills" in the embryonic infant, are *functional*, that is, they are actually employed in *breathing*, as in a living fish! This defense of the "new philosophy" out-Haeckels even Haeckel himself, since the renowned Professor of natural science in the University of Jena never dreamed of such thing as that these embryonic "gill-arches" were employed in any functional way, regarding them merely, to use his own expression, as the "ontogenetic record of man's phylogenetic or tribal descent from some fish-like ancestor." Now it is a fact, upon which, I believe, all well-informed physiologists are agreed, that an infant does not "breathe" at all, till its exposure to the external air, and that during gestation, it depends entirely for nutrition upon the substance of the ovule and the umbilical circulation of the mother. Yet this important physiological announcement makes it *breathe* by two different processes prior to the functional use of its lungs. If it really be a "physiological fact," that the human embryo depends for its vitality upon *breathing* through these so-called "gills," it suggests a serious difficulty, which no one is more competent than the Boston lecturer to explain. As these "gills" *entirely disappear*, according to all authorities, including Prof. Haeckel, *at the eighth week of gestation, how does the embryo manage to put in the interim of twenty-six weeks till its birth without breathing at all?* It is a matter to be deplored that such nonsense as this gill-breathing process should be taught as "physiological" science in the very literary and scientific center of this country, just because Draper, or some other authority, chanced, inadvertently, to speak of such a stupid impossibility as a human embryo breathing through "gills," or through anything else, in fact, prior to its birth. "*Prob-lem of Human Life.*" pp. 20-23.

The truth is, and it is a glorious sign of the times, for which the *Problem of Human Life* under God's providence may take due credit, that both Joseph Cook and Dr. McCosh are now heartily ashamed of their evolution departure, in so hastily bowing the knee to the atheistic Baal of the development theory set up by Darwin and Haeckel. No better proof of this on Joseph Cook's part is needed than his brief letter to Prof. Cheeks, in the very face of his published statements that we once breathed through "gills" *without interfering with our present "identity."* Of course if there is any meaning in his words, this proves that even now the man and the fish are *identical*. No wonder he should now wish to obliterate his published assent to such a theory, by claiming that his language had been misinterpreted. But it would be more to his credit as a great Christian philosopher, if he should come out in a lecture and publicly recant the whole evolution blunder and make a clean breast of it. Such a lecture properly announced would give him the largest houses he has ever yet had. If he should be at a loss how to make up such a lecture, in direct opposition to his previous teachings, let him call upon us and we will help him to the necessary facts and arguments with which to prepare it.

And as proof that Dr. McCosh is also ashamed of his former evolutionary teaching, we have only to read his last work, entitled "*Development*," and the evidence is glaring enough. In that work which we have gone carefully and patiently through, he makes many statements as to what "*Development*"—meaning thereby "*evolution*"—is claimed to do or not to do, how it is claimed to act, and theistically under providence to be God's method of the creation of the different species, etc.; but it is a notable fact that in the entire treatise he never once says, or even intimates, that he now believes the doctrine to be true! He intimates that it *may be* true or that it might have been God's method of creation; or, on the other hand, that God might have created the species directly or miraculously, as He could, of course, easily have done had He been so disposed, etc., etc. And thus he leaves it, without daring to inform the reader in so many words, that he himself is still, as formerly, an evolutionist! He has evidently, like Joseph Cook, been reading the "*Problem*," and has concluded to taper out his evolutionary sentiments by giving to the public this last noncommittal plea and evanescent defense, which, though able as a literary production, is the weakest pretended argument for a scientific theory that we have ever examined. The public can rest well assured that this is the last it will ever hear from these distinguished philosophers in favor of human "gills," infantile embryonic "tails," and the "development" by transmutation, of human beings from piscatorial vertebrata. They have both been passing recently through a most important and revolutionizing process of intellectual "development," that has, as we trust, opened their eyes and completely cured them of Darwinian evolution, either atheistic, agnostic or theistic. It now remains for them publicly and honestly to recant the whole doctrine, and thus in a measure atone for the evil they have wrought in having previously given it their countenance. Will they do it?

CLOSE OF VOLUME THREE.

This number (July) closes volume three of THE MICROCOSM. It seems but a dozen weeks, instead

of a dozen months, since we sent out the first number last August, so swiftly and imperceptibly does time fly. The work is driven along so steadily, and the mental application is so incessant, that little or no account can be taken by a mind thus relentlessly occupied, of the passing days, weeks and months. But swiftly as have flown the successive issues of this Magazine, we are glad to be able to say that not a number, or even contribution, has slipped out of our fingers by chance, or without having received the most thorough editorial scrutiny of every page, paragraph and sentence contained in it. This is not intended as intimating that everything THE MICROCOSM has contained during the volume now closed is perfect, or free, even from glaring faults. We only aim to declare that in the interest of our Subscribers, we have given each number in all its parts the most conscientious attention, before sending it forth on its mission. If imperfect, the fault is ours; but if the various numbers of the Magazine have anywhere nearly equaled in merit the personal interest and care bestowed upon their contents editorially, they must contain a treasure of religio-scientific and philosophical knowledge, that has been of inestimable value to the reader. The question is now brought home to our subscribers:—has the management of this journal, judged by the manifest results of its conduct during the volume here closed, merited the reader's confidence and support during another year? This is the practical question upon which much of the usefulness of THE MICROCOSM depends in the future. If this question can be justly answered in the affirmative, then let each reader who may thus respond, show his faith by his works and at once renew his Subscription for Volume Four, thus giving it a send-off that will cheer the hearts and strengthen the hands of both editor and publishers. And so shall we mutually aid each other as co-workers in the cause of truth.

We have only one more word to say to the reader. If any person can be found to take our place as editor, who could make THE MICROCOSM more successful and useful than it now is, we would freely step down and out, giving him our place, and would as cheerfully take the position of a contributor instead. For gladly would we exchange the sleepless toil and care it now costs us, with all the honors involved, for a single year of unrestrained rest and recuperation. But following in the line of duty, as indicated by the hundreds of volunteer letters we are receiving from enthusiastic readers of this journal, we see no let up in our work for the present; and hence, *alone* if it must be, we set our compass for another round trip of the good craft *Substantialism*, and ask every present passenger who approves of our accommodations not only to accompany us on our new voyage, but to enlist as many additional recruits for the trip as possible.

THE CHRISTIAN STANDARD CONTRO- VERSY.

Elsewhere in this number will be found another, and we fear the last, installment of the controversy between the *Standard* critic and Eld. Thomas Munnell, with some Microcosmic remarks extending the answer to a couple of additional objections raised by the critic for which there was not room in the response. It now becomes necessary as a matter of justice to the reader, to give a word of explanation in reference to the true inwardness of this controversy. It was distinctly agreed at the start between the office editor of the *Standard* and Eld. Thomas Munnell, that the latter's responses to the *Standard* criticisms might, if deemed necessary, be written by us, but must be signed by Eld. Munnell to insure their appearance in the columns of the *Standard*, since articles from our pen were not admissible to those columns for obvious reasons well known to our early subscribers.

Well, it so turned out that when our last response was written and sent to Eld. Munnell, just as it appears elsewhere (page 367), the Elder had received peremptory orders that only about one half that much matter would be allowed in one number of the *Standard*. In this dilemma and in his anxiety to have some reply appear, he (as it now turns out from the *Standard* of June 7, which has come to hand since the two articles referred to were in type) wrote an answer himself which, from its brevity and more general character, failed to take up and meet specifically the ingenious difficulties and objections which had been presented by the office editor. In replying to this response of Eld. Munnell's, the critic makes the most triumphant and sarcastic claim of victory, boasting, as he has never boasted before, that the entire citadel of Substantialism had been surrendered by passing over these difficulties unnoticed. As a specimen of his provoking style here is a bit of his virulent language:

"If there is a document extant that has a larger surface of trifling to the square inch than it, the fact is not generally known. In it there is not so much as an attempt made to reply to even one of the many points made against the author's many objections. He deals almost entirely with what we did not say," etc., etc.

This cutting, but unjust charge of trifling more than justifies the course we had resolved upon taking in advance, in giving the response to the *Standard's* criticisms just as it was originally written, in which we now claim, and as the reader will readily see, lets the bottom drop out of every objection and difficulty the office editor raises, exposing, in the most specific manner, his ignorance, not only of the principles of the Substantial Philosophy, but of the elementary laws of physical science as well. His shouts of supposed triumph over the fact that his previous objections

were not, and of course could not be, individually met and specifically answered, now ingloriously recoil, as a premature explosion of dangerous ammunition, and the whole affair kicks back into the face of the unfortunate critic as badly as will his own maladroitness shot-gun argument, when he comes to read our answer. Not a single point do his criticisms touch upon that is not annihilated in the response as here printed. We ask the reader carefully to study both the *Standard* article and our response, as well as the two previous papers in the May number of this Magazine, and he will see the wretched folly of any man attempting to oppose the Substantial Philosophy. The office editor has the faculty of using great swelling words, as he does in his last reply, about his triumphant overturn of "*the miserable nonsense that Wilford Hall is palming off on the People*;" but we challenge him to accept the proposition we make him in this last response at page 369, bottom of first column, and (without "whipping the devil around the stump" by using the name of some one else, thus deceiving his readers by keeping the name he fears out of sight) meet us in the space of one column of the *Standard* each—both sides to be printed also in *THE MICROCOSM*. He has plenty of space in the *Standard*. Will he accept our proposition? Or will he prefer to fortify himself against assault behind the capitalized heading, "CONCLUSION," which he raises conspicuously at the beginning of his reply to Eld. Munnell, and thus ingloriously back out of the contest? We shall see. But whether he refuses to meet us or not, he can rest assured that his most intelligent readers will see this article and will read the crushing answers to his ingenious quibbles in this number. Such readers will readily grasp and comprehend the animus of his cheap bosh about the "miserable nonsense" of Wilford Hall.

WINDOWS RATTLING BY SOUND.

AN IMPORTANT DEMONSTRATION.

We have repeatedly shown in editorial articles in *THE MICROCOSM*, as well as in our original treatise on the subject of sound, in the *Problem of Human Life*, that the breaking of windows, miles away from an exploding magazine, was in no sense the result of the sound of the explosion, but was simply the effect of a powerfully condensed air-wave, driven off in all directions by the sudden addition of an immense quantity of powder-gas, generated instantaneously by the same explosive action that generates the sound. We have shown by various illustrations that sound, *per se*, will not stir a feather directly at the exploding magazine, much less break windows miles away, unless such feather is *tuned*, or tensioned in unison to the pitch of the tone that causes it to vibrate. Then the feather, or string, or membrane, or whatever other body, moves only by sympathetic vibration, as we have fully and repeatedly explained. This rational and simple explanation of the shattering of windows miles

away from an exploding magazine, which no scientist who values his reputation now dares to dispute, is entirely new to science. Startling as the statement may seem, and astounding as it will appear on record to future generations, it is nevertheless an undeniable fact that up to the time of the publication of the *Problem of Human Life*, not one writer of the thousands who had treated on this very phase of acoustical science had ever hinted at the true cause of the breaking of distant windows at the time a magazine explosion takes place; but they had invariably and with one accord attributed it to the "sound," or "noise," of the explosion, as we proved in the December number of this Magazine, by quotations from standard authorities. We challenge any scientist who reads this article to vindicate, if he can, the fame of acoustical writers, by referring to a single instance on record where that book was anticipated in this true solution of these window-breaking phenomena, by any writer living or dead, and we will gladly publish it in THE MICROCOSM. Yet, so self-evident is this true solution as we originally presented it, that it leaves the great acoustical writers of the present and past under a dense cloud of distrust as to their ability to treat correctly any scientific theme upon which they have written. Why, reader, an observant child would know, could it be brought to reflect on the subject, that no such effect as the shattering of windows miles away from an exploding powder-mill, could be caused by the *sound* of such explosion, when a terrific thunder-clap—the most intense and deafening sound that ever addressed the ears of mortals—does not mar a pane of glass in the very building where the bolt strikes! Hence, we lay no claim to an extraordinary degree of perspicacity for having been the first to make this elementary discovery. We would rather have regarded ourself as unworthy of the name of a scientific investigator even of a third-rate order, if in treating directly upon that phase of acoustics we should have been incompetent to detect so glaring and superficial a fact, as that it was the condensed wave of air caused by the added gas which broke the distant windows instead of the "*sound*" or "*noise*" of the explosion. Yet Professors Tyndall, Helmholtz, and Mayer, the three greatest living writers on acoustics, as well as the writers in all the encyclopedias and natural philosophies, innocently put it down as settled science to be taught to young students, that it is the "*sound-pulse*" or "*noise*" of the explosion that breaks the distant windows; never intimating or even dreaming that the thousands of cubic yards of gas, instantaneously generated by the burning powder, had anything at all to do with such disastrous effects. Is it not passing strange that such profoundly educated scientists, even if they had not thought of the thunder-demonstration at all, as just referred to, should have overlooked the fact that the very same cause that breaks windows at a distance is what uproots trees, levels buildings, and disintegrates men and animals, scattering their fragments over acres of ground, nearer to the exploding powder? Instead of seeing the absurdity of attributing these more terrible results to mere *sound* or *noise*, and thus having their minds enlightened as to the true solution of the entire problem, including the breaking of distant windows, they absolutely closed their eyes, as we must think, and concluded that the "*noise*" is what kills men and animals, as witness the article on Acoustics in the *Encyclopedia Britannica*, written by Prof. Leslie, one of the

ablest writers on sound in England, and next to Prof. Tyndall in point of authority. To show the drift of the general teaching in acoustical works on this phase of the sound theory, we again quote Prof. Leslie's words:

"Thus the *noise* of the explosion of a powder-mill is heard, and often *dreadfully felt* at a great distance all around the scene of disaster."

As stated last December, Prof. Leslie or Prof. Tyndall ought to suppose it to be the "*noise*" of the overcharged fowling-piece that kicks them over on firing it, as it is simply the recoil of the gun's breech against the shoulder, just as it is the recoil of the air against the shattered building, by the added gas generated at an explosion of a powder-mill, that does the damage. The monstrous absurdity that sound consists of air-waves bore its legitimate fruit when it was logically carried out to the idea of a "*noise*" being "*dreadfully felt*" when buildings were torn down by it over peoples' heads! With such a prodigious fallacy as this taught in all the text-books, is it surprising that our unheralded exposure of the glaring want of perspicacity should strike these writers with a convulsive force something like one of their own "*sound-pulses*"? There is little wonder that the "*noise*" of the explosion of the ridiculous wave-theory was "*dreadfully felt*" in the camps of Tyndall, Helmholtz, Leslie, Mayer & Co., and it is not at all surprising after such a shock that no amount of coaxing, challenging or badgering can induce them to write one sentence in favor of the exploded theory. No wonder that these former great lecturers on *sound* now take up almost any and every popular scientific theme for public entertainments, but are deaf as adders to the urgent appeals of learned societies for courses of lectures on *Sound*! Why is this thus? And what hypocrisy to pretend, after such confessed timidity, that they entertain a feeling of contempt for the exposure which has thus silenced their heretofore most interesting courses of lectures! Can anything explain the anomalous state of affairs, but the self-consciousness by Tyndall, Mayer & Co., that "*Othello's occupation's gone*"? Is it at all likely, if our arguments against the wave-theory were weak and fallacious (though strong enough to convert scores of studious professors of physics), that the great scientists we have criticised would amiably and patiently bear the lash of these humiliating exposures and not publicly reply, especially when the columns of this Magazine are freely offered to them, and when they could thereby reach more than fifty thousand of the most intelligent scientific readers in the land? Bosh! a thousand times *bosh*! No, the real secret of this "*silent-contempt*" dodge is, that Professors Tyndall and Mayer know full well if they should utter the first word, or write the first sentence in reply to these exposures of the wave-theory, that they would open a crevasse that would hurl an inundation upon the formulas of modern science that all the college levees and university embankments in this land, would not be able to check till the bulk of their superstructure would be washed away. They know that the very first attempt on their part at a reply to this attack upon the wave-theory will be the signal that will direct all eyes upon the final result of the contest that will thus be inaugurated, the end of which they are too shrewd not distinctly to forecast. Hence, as a matter of simple business policy and acting on the law of self-preservation, they have sealed their mouths upon this subject, and locked up their pens. One thousand pounds sterling,

would not induce either Tyndall or Mayer to write a single article in reply to "Wilford Hall's" book.

But we started out to state a beautiful illustration of the effects of sympathetic vibration in contradistinction to the effects of breaking windows by a gas-wave sent off from an explosion of powder, a class of phenomena which we will now explain. Within a few blocks of the hotel where we board and lodge in this city, is a sugar-refinery, which employs the most powerful and deepest-toned steam-whistle, it is said, in the world. Every morning at seven o'clock, this whistle signals the employes of the establishment to their work, in addition to waking anybody within a mile of it who happens to be asleep. As we lie in bed waiting for this terrific signal, (for we confess we lie till seven o'clock, for scientific purposes of course), we listen attentively for the furious rattle of one of the panes of glass in our bedroom-window, that never fails to respond to this deep-toned bellow. But now comes the beautiful part of this interesting scientific experiment. The whistle begins low and soft, and gradually rises in pitch and increases in intensity, till the maximum of both is reached, where it holds for a few seconds and then commences falling in pitch and weakening in force at about the same rate that it went up. Near to the lowest key of this massive tone, or at about one-quarter, or possibly one-third of its rise from the bottom, occurs the rattling point for our scientific pane of glass. Few can ever know the philosophical satisfaction we have in waiting for this signal and watching for this splendid example of sympathetic vibration; so much so that the best breakfast in New York city could not induce us to be an early riser, and thus miss this intellectual repast. As the whistle gradually rises in pitch, the rattling point of sympathy is finally touched where the pane has the exact tension or vibrational number of the whistle's tone. This rattle by its impetus continues for about a second, when it ceases entirely, while the tone of the whistle continues on up increasing tremendously in force; but not a sound comes from this or any other pane of glass in the window, though the bellow is enormously stronger above the point of rattle than at it. But in a moment the strength and pitch begin to reverse, and when at the same vibrational number precisely, we have the same sympathetic rattle of our favorite pane, which again continues for about a second, and all is over as before. Now the lesson that this teaches is this: that the breaking of windows at a distance from a magazine explosion, is a class of phenomena entirely different and distinct from the phenomena of sympathetic vibration, such as this we have described, or those where parts of a building have been known to jar by the sound of distant thunder. This distinction however, between the shattering of glass as the effect of an air-wave sent off from an exploding magazine, and the beautiful action that is awakened in a tensioned body, by the sympathy of a tone of corresponding pitch, we assert again, was never intimated in any published work till it first appeared in the *Problem of Human Life*.

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"CORPUSCULAR OMISSIONS."

"Our guide called our attention to a strange and unaccountable acoustic phenomenon in the old Senate Chamber. The floor is laid off in squares, and placing me upon a certain one, he bade me call aloud. We did so, and were surprised to find that the echo seemed to come right up from our feet, and we could feel it like a kind of electric shock through the whole system. Then stepping a few squares away, our guide directed us to do the same when his voice's echo thrilled our every muscle, and ours did the same for him. The moment one steps off these squares the effect is wholly lost.

"There seems to be no explanation for this strange freak of the echo, and we doubt whether Wilford Hall's new theory of the corpuscular omissions of sound can afford a satisfactory solution."

The above is from a letter of Rev. Isaac A. Sites, Freeport, Ill., written from the Federal Capital to the *Christian World*, Dayton, Ohio. It seems that the Author of "Grandmother Vale" and sundry other Serials has read just enough of *The Substantial Philosophy* to mingle a smattering of knowledge with a most ridiculous mistake in the use of terms. Corpuscular O-missions of sound! While one of our intelligent subscribers at Freeport is out looking for a doctor, we take the liberty of informing the *World's* correspondent that the phenomenon of which he speaks is only the reflection of sound pulses directed to certain points in the building by a rebound after striking some distant object, analogous to the rebound of an india-rubber ball. This is fully explained in the *Problem of Human Life*, and shown to be only solvable on the supposition that sound consists of substantial corpuscles, since waves (as shown by water-waves) do not rebound at all on the principle of reflection or at the angle of incidence. Nothing can thus reflect or rebound but substantial particles traveling at a given forward velocity and striking some obstructing body, which proves both light and sound to be substantial *emissions* instead of "omissions." The Substantial Philosophy *omits* nothing in its solution of sound problems.

THE PAMPHLET ON SUBSTANTIALISM.

We hardly know how to decide about getting out the missionary pamphlet on Substantialism. There has not yet been one quarter enough pledges for copies to meet the expenses of getting it out, including electrotype plates, etc. Had we the means to spare, we should not stand on the order of our going, but go at once. We may even yet conclude to risk it, and trust to our subscribers being more liberal in purchases than pledges. We are sure, as Rev. Dr. Bailey originally expressed it, that such a document would do great good in turning the thoughts of the masses to that nobler conception of a substantial hereafter for humanity, rather than that vague and meaningless existence indefinitely taught, or rather left to be inferred, in current theology. If there are any others desiring it, who have not yet expressed a wish to see the pamphlet issued, let them speak out when sending in their renewals for volume four, and more than likely we will see our way clear to send out the little missionary soon after getting the new volume under way. Remember that the pamphlet will contain seventy-two pages with cover, embracing the choicest arguments that have appeared and that can be produced in favor of Substantialism, such as our contribution on that subject to the *Christian Quarterly Review*;

"Immortality of the Soul Philosophically Demonstrated," "Does Death end All?" etc., etc. The price will be 10 cents per copy, post paid. Let each person agree to take at least ten copies to be loaned or sold to the people to aid the cause of truth.

A SPECIMEN OF TRUE GRATITUDE.

As an illustration of the grateful feeling many persons entertain towards those who were instrumental in calling their attention to the *Problem of Human Life*, here is a new proof from Ward & Co., General Life Insurance Agents, at Minneapolis, Minn., who on sending for their second \$15 worth of books as life-subscriptions, remark:

"With this second lot of books on your life-subscription offer, please send the life-certificate for WILFORD'S MICROCOSM to Dr. R. L. Thurston, of this city. He is already a subscriber to your Magazine, and was the one who first called our attention to the *Problem of Human Life*, loaning us a copy to read. We feel it but a just expression of our gratitude to the Doctor to present him with a life-certificate to your excellent Magazine for the favor he did us.

Yours very truly, WARD & Co."

ADVERTISEMENTS IN THE MICROCOSM.

Friends of THE MICROCOSM have suggested that we adopt the course of other magazines and take a few paying advertisements, to be printed on additional pages, so as not to encroach upon the present amount of reading matter. We have decided to do so. Such added leaves can be easily separated from the magazine proper, on binding the volume at the end of the year. Our invariable price will be for each insertion, brevier type, \$40 for a whole page; \$22 for a half page (one column); \$12 for a half column; or \$7 for a quarter column, which is the smallest advertisement taken. Persons having something really useful to make known to the public, may take advantage of our great circulation, on the above terms, *cash*. We will send off not less than 55,000 copies of the next number (August). As no advertisements have heretofore appeared in these pages, everything will be certain to be read, thus making this Magazine the cheapest advertising medium in the country. All advertisements for any issue should be in our hands by the 15th or 16th of the month previous. Address,

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A FLYING MACHINE INVENTOR IN LUCK.

We are right glad to learn that Prof. Ritchel, of Bridgeport, Conn., our old time friend and room-mate fifteen years ago, when he was as poor as we are now, has fallen heir to \$100,000 left him by a Mr. Maxwell of Wisconsin to assist him in perfecting his ingenious apparatus for navigating the air. We look now confidently for some important work to be done by the Professor, in the way of improved machinery for air-navigation before that legacy is expended. We must still insist that animate beings, as weighty as ordinary men, ought yet to be able to fly through the air by the aid of wings and physical strength alone, as did the pre-historic *pterodactyls*, which weighed at least 400 pounds. Will not Prof. Ritchel, now that he has the means, solve this problem?

OUR ARMY OF CONTRIBUTORS.

In the next number of THE MICROSCOPM (No. 1, Vol. 4), we promise our readers a repository of valuable contributions unsurpassed if not unequalled in any previous number since this journal was first issued. We have had the pleasure of receiving, during the entire volume now closed, many letters congratulating us, as each number was issued, upon the fact that it was decidedly better than any of its predecessors, excellent as each and all were admitted to be; many of these letters declaring this, that, or the other paper of some one of our contributors worth more than the year's subscription. We believe this will be the sentiment of a vast majority of our readers, when they shall have examined the opening number of the next volume. As a specimen of its contents we may name as among the choice articles now on hand for that number the following:

Rev. Dr. Swander, A. M., "World Without End." Isaac Hofter, Esq., "Evolution"—first of a series of papers. Prof. Lowber, Ph.D., "Man and the Monkey." Mrs. M. S. Organ, M.D., "Drug Medication." Rev. Thos. Nield, "Inertia explained." Dr. Balsbaugh, "Even as He is Pure." Capt. Carter, "The Velocity Question." Prof. Kephart, A. M. (Prof. K.'s article has not yet arrived). Rev. J. J. Smith, D.D., "Evolution only a Hypothesis"—No. 4. Judge Lanhorne, "A New Attempt to Solve an Old Problem." Rev. Dr. Van Dyke, "Man's Moral Nature Not an Evolution"—No. 2. Rev. D. Oglesby, "The Moral Faculty." Rev. S. C. Fulton, "Human Action not Necessitated." Prof. E. A. Luster, "The Theory of Latent Heat." Prof. I. N. Vail, on Barometric Changes. Prof. G. R. Hand, "Tympanic Vibration." Prof. W. D. Strong, "The Nebular Hypothesis." Hon. B. J. Pengra, "On the Mind of Man." Prof. J. R. Sutherland, "Immortality." Prof. R. Van Horn, "The Nature and Causes of Wind." Dr. Cronin, "Reply to Dr. Bowle." Rev. Dr. A. L. Cole, "The Difference." W. H. Rowlett, Esq., "Mind and Matter." Rev. W. M. Allen, "Variation of Sound Intensity." A New York Professor's Correspondence with Prof. Tyndall. Prof. I. N. Vail, "The Death of a Day"—a Poem. Rev. A. S. Lovell, "New Theory of Earth-quakes." Rev. Dr. G. H. McKnight, "Foreknowledge vs. Predestination," &c., &c., besides sundry editorials, such as the first installment of Ward Beecher's apostasy, "Beginning of a New Volume," "Christ's Miracles Scientifically Considered," etc. It is scarcely probable that all the foregoing list of papers can appear in one number of the MICROSCOPM, though we are willing to guarantee that the reader will be abundantly satisfied.

VOLUME 3, BOUND IN CLOTH.

Many of our subscribers are already beginning to inquire about the present volume bound substantially for their libraries. We propose at once to get up an edition and to send copies by express prepaid, at exact cost (\$1.25), to accommodate our subscribers. This will be about what it would cost to have a single copy bound from the number, and will thus enable a liberal-minded subscriber so disposed, to use his loose numbers to loan to his neighbors as paper missionaries. All who want the third volume bound can remit for it when renewing for volume four, if convenient. We have also a few copies yet left of volumes one and two bound separately, which we will send at same price—\$1.25 each; or we will send the three

A number of our old subscribers who took the first volume of THE MICROSCOPM, including the Rev. Dr. L. W. Bates (the very first purchaser of a copy of the *Problem of Human Life*), have urged us to adopt the old plan and give two pages in each number of this magazine to "MICROSCOPIC DEBATS," consisting of short items of general interest, as a relief to the mind from the intense application necessary to grasp our many original articles. We have decided in response to this appeal, to adopt the old microscopical department for the coming fourth volume, because we think that the thousands of terse and valuable items thus collected during the year will be an important addition to the volume, and of real interest to the general reader.

THE CONTENTS OF THIS NUMBER.

We are confident that our subscribers, who will attentively read the various articles in this closing number of volume 3, will honor THE MICROSCOPM with the voluntary verdict that its pages have not in the least deteriorated since the first number of the volume was issued. We doubt if a consecutive series of contributions in any one number of this magazine shows a more formidable array of real argumentative talent than those of Dr. Roberts, Prof. Kephart, Dr. J. J. Smith, J. R. Hoffer, Elda Miles, Prof. Wood, Dr. Swindall, Mrs. Organ, M. D. occurring in the order here named. Several of these papers are of a high order while each is worthy of careful study and should receive it.

OUR MAILING WEEK.

Subscribers will please take notice that for a week or ten days about the 1st of every month (a little before and a little after the 1st), is our busy mailing season, when, if answers to letters and orders should be a little neglected, no alarm need be excited, as we are necessarily compelled to economize and employ no more force than is actually required to do the work of this office. Persons expecting to change their addresses, should always have the notice here by the twenty-fifth of the month previous to the date of the issue to be changed. It is policy for a subscriber, thus changing address, to make arrangements with P. M. to forward the magazine, should the subsequent number arrive.

OUR LIFE-SUBSCRIPTIONS—THE CLOSING CHANCE.

As all subscribers for this Magazine, who wish to take it during the next volume, will probably lose no time in renewing their subscriptions, is it not an opportune moment to cast about and see if we have not a few subscribers who would not only secure the life-certificates virtually free by a little effort, but

could save out of the profits of the books sold enough to retain one complete set of our publications for their libraries. See the wholesale terms for books and new subscriptions below, or send for special circular. This is the last chance for obtaining life-subscriptions free, as the offer will be withdrawn next month. As soon as this occurs, the list of life-subscribers will be published in THE MICROCOSM.

WHOLESALE PRICES OF OUR BOOKS.

For the information of those who might desire to take advantage of our life-subscription offer before it is withdrawn, we here give briefly the wholesale prices of our books by express, the purchaser paying charges. *The Problem of Human Life*, cloth, 75 cents,—retail price \$2; leather, \$1.25,—retail \$2.50. *Universalism Against Itself*, 50 cents,—retail \$1. *Walks and Words of Jesus*, 50 cents,—retail \$1. MICROCOSM (1st and 2d volumes bound together), \$1.25,—retail \$2.50. Third vol. MICROCOSM, bound, 75 cents,—retail \$1.25. *Retribution* (now nearly out of print); *Through the Prison to the Throne*; and *Death of Death*, 75 cents each,—retail, \$1. New subscriptions to MICROCOSM, vol 4, will be counted in with the \$15 worth of books at 75 cents each. A selection of any of the above named books, to make up \$15 worth, will secure a life certificate for THE MICROCOSM. If preferred, the books will be sent by Express, C. O. D., if \$2 shall be sent in advance with the order. Or any person sending \$2.50 extra (\$17.50 in all, *cash with the order*), the Express charges on the books will be prepaid to any part of the United States. This is the last chance to secure a life-certificate on the above easy terms.

BACK NUMBERS OF THE MICROCOSM FREE FOR DISTRIBUTION.

[From Last Month.]

We have several hundred copies of odd numbers of the *second* and *third* vols. of THE MICROCOSM left over, which we now propose to send free to our friends who are disposed to try among their neighbors and acquaintances to raise a club of subscribers for Vol. Four of this magazine, commencing with the August number. Any friend who may wish to try to raise such a club, of *three*, *four*, *five*, or more names, will receive free, on application, a few copies to loan, to be read and returned, and reloaned, and so on till worn out. This will save talking, and will prove a hundred-fold more effective in convincing strangers of the importance of THE MICROCOSM than anything its most eloquent friends can say for it. If lovers of this Magazine will pursue this course patiently, they will have little difficulty in working up clubs of intelligent subscribers, and thus secure one of the books named as premiums, which see below.

RENEWALS FOR VOLUME FOUR.

[From Last Month.]

Our subscribers will please take notice that the price of volume four of THE MICROCOSM will be for renewals invariably \$1. It ought to be \$1.50, to afford anything like living profit. This is the opinion of all candid patrons of this Magazine, considering the fact of the vast amount of *original matter* it presents every month—more in fact than any other journal now published. At its present

price not one penny can be saved over expenses at the end of the year, even with our large subscription list. The Editor absolutely works for nothing year in and year out; and what is better, he asks nothing. Subscribers should not, therefore, in simple justice between man and man, think of deducting any percentage from the \$1, because they may heretofore have acted as agents; and received twenty-five cents discount on new subscribers. We will still give this discount for clubs of new subscribers, or we will give the fourth copy one year free for a club of three new subscribers with \$3. Or we will give for three new subscribers (\$3) either of the following books as premiums:—*Universalism Against Itself*, *Walks and Words of Jesus*, *Retribution*, *Through the Prison to the Throne* or *Death of Death*. Or for four new subscribers (\$4), the *Problem of Human Life* (cloth), or for five new subscribers (\$5) the *Problem* (leather), or volumes 1st and 2d of MICROCOSM bound together (cloth). These are the best terms during volume four. See life-subscription offer, and wholesale prices of books elsewhere.

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ANOTHER SURPRISE GIFT.

We have just learned as we go to press with this number that Mr. M. C. Tiers of this city, the artist, is now finishing a superb canvas as a birthday present to the editor, to be formally presented to him on the 18th of next month in honor of the 65th anniversary of that natal event. The painting is entitled "Wilford Hall and his Lieutenants." It contains our own likeness, surrounded with a group of two dozen of our leading contributors and writers for THE MICROCOSM, in perspective (not the ordinary grouping), the photographs of whom Mr. Tiers has been collecting for some time. The canvas is of large size, so that each portrait may be a perfect likeness. In the background will also appear the portraits of the six great scientists whose likenesses constitute the frontispiece of *The Problem of Human Life*, with allegorical figures in the four corners of the painting representing *Science* and *Religion*, the whole constituting a most beautiful and unique work of art. Its value to the editor, as well as to his friends, can neither be expressed in words nor dollars. The artist, famed as he already is for excellent portrait work, has surpassed himself in this last painting, and has proved his right to rank along side of the great masters in European art.

As soon as the painting shall have received its finishing touches we will have photographs of it struck off, cabinet size, for our readers, to be sent free to every one who may become a new subscriber or who will renew for volume four by sending \$1. Agents who may send us subscriptions at premium or club rates, or with life subscription orders for books, can also offer each new subscriber for volume four one of these photographs. The portraits in this group will be numbered, and will be accompanied with a corresponding list of names. Those of our readers who appreciate the excellent contributions appearing monthly in this magazine will hardly miss the opportunity of looking upon the faces of the writers, especially when they can be had so easily. We feel sure that our contributors who have done so nobly in helping to build up THE MICROCOSM will join with us in thanks to the artist. More on this subject next month.

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